STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Air Pollution Control
15th Floor, William R. Snodgrass Tennessee Tower
312 Rosa L. Parks Avenue, Nashville, TN 37243

October 18, 2019

Mary S. Walker
Regional Administrator
US EPA, Region IV
Atlanta Federal Center, 11th Floor
61 Forsyth Street, SW
Atlanta, GA 30303-3104

RE: Pre-hearing Submittal of Middle Tennessee Counties Non-Interference Demonstration for Removal of the Vehicle Inspection Program

Dear Administrator Walker,

I am pleased to submit the enclosed pre-hearing version of Middle Tennessee's Noninterference Demonstration for removal of the Inspection and Maintenance (I/M) program for Davidson, Sumner, Rutherford, Williamson and Wilson Counties in Middle Tennessee. Public Chapter No. 953, signed into law on May 15, 2018, requires the elimination of the I/M program 120 days after final EPA approval of the 110(l) report. To potentially expedite the final approval, we are requesting parallel processing of this submittal.

We have scheduled a public hearing at the Tennessee Bureau of Investigation Office:

Tennessee Bureau of Investigation
901 R. S. Gass Boulevard
Nashville, TN 37216

on November 19, 2019 at 5:00 pm. The public comment period will close on November 19, 2019. Pending responses to comments, it is anticipated that the Noninterference Demonstration Report will be presented to the Tennessee Air Pollution Board for final approval at the next Air Board meeting in either December 2019 or January 2020. Submittal of the final report to the EPA will occur thereafter.

We have worked closely with your staff throughout the development of this 110(l) report and greatly appreciate their time, effort and consideration.

If you have any questions or require additional information on this 110(l) report, please feel free to contact me at (615) 532-0554.

Sincerely,

Michelle W. Owenby
Director

Attachments (2)

Ecc: Ken Mitchell, EPA Region IV
Lynorae Benjamin, EPA Region IV
Andres Febres EPA Region 4
John Finke, Nashville/Davidson Merto Health Department

Attached Documents

Attach	Description
Attachment 1	Public Hearing Notice
Attachment 2	Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance Program in Middle Tennessee

Attachment 1

Public Hearing Notice

NOTICE OF HEARING

TENNESSEE DEPARTMENT OF ENVIRONMENT AND
CONSERVATION DIVISION OF AIR POLLUTION CONTROL
WILLIAM R. SNODGRASS TENNESSEE
TOWER 312 ROSA L. PARKS AVENUE, 15TH
FLOOR NASHVILLE, TENNESSEE 37243
PHONE: (615) 532-0554 FAX: (615) 532-0614

NOTICE IS HEREBY GIVEN, the Division of Air Pollution Control will hold a public hearing pursuant to Tennessee Code Annotated, Section 68-201-105:

Date:	Tuesday, November 19, 2019
Information Session:	5:00 - 5:15 PM
Public Hearing:	5:15 - 6:15 PM
Location:	Tennessee Bureau of Investigation 901 R. S. Gass Blvd Nashville, Tennessee

There will be a public hearing before the Technical Secretary of the Tennessee Air Pollution Control Board to consider a proposed change to the State Implementation Plan (SIP) under the authority of Tennessee Code Annotated, Section 68-201-105.

The hearing will be conducted as prescribed by the Uniform Administrative Procedures Act, Tennessee Code Annotated, Section 4-5-201 et. seq. and will take place at the date, time and location indicated above.

The public hearing has been called to consider the Clean Air Act Section 110(l) Noninterference Demonstration for removal of the Inspection and Maintenance (I/M) program for Middle Tennessee. Public Chapter No. 953, signed into law on May 15, 2018, called for the elimination of the I/M program 120 days after final EPA approval of the 110(l) report. The I/M program is currently required as part of the State Implementation Plan (SIP) in Hamilton County and Middle Tennessee (Davidson, Sumner, Wilson, Rutherford, and Williamson Counties). In order to remove the requirement from the SIP, the Division must demonstrate that I/M removal does not interfere with attainment or maintenance of National Ambient Air Quality Standards (NAAQS) for ozone, $PM_{2.5}$, SO_2, NO_2, CO, and lead.

The I/M program requires an annual light-duty motor vehicle onboard diagnostic (OBD) inspection or tailpipe inspection to ensure that the vehicle's emissions are properly controlled. The 110(l) technical report details the results of a sensitivity analysis showing a projected small increase in ozone values. Middle Tennessee is currently in compliance with all National Ambient Air Quality Standards, and removal the I/M program will not interfere with continued attainment or maintenance of the air quality standards.

The SIP revision will remove the Federally mandated requirement for and I/M program in Middle Tennessee. Metro Nashville retains the right to continue a vehicle emission testing program on a voluntary basis.

All persons interested will be allowed to present testimony to the hearing officer regarding the proposed revision to the SIP. Anyone desiring to make oral comments at this public hearing should prepare a written copy of their comments to submit to the hearing officer at the hearing. The hearing officer may limit the length of oral comments in order to allow all parties an opportunity to speak, and will require that all comments be relevant to the proposed SIP revision. Written statements not presented at the hearing will only be considered part of the record if received by close of business (4:30 PM Central) on November 19, 2019, at office of the Division of Air Pollution Control at the address provided above.

Individuals with disabilities who wish to participate in the hearing (or review the file record) should contact TDEC to discuss any auxiliary aids or services needed to facilitate participation. Contact may be in person, by writing, telephone, or other means, and should be made no less than ten working days prior to November 19, 2019, to allow time to provide such aid or services. Contact the ADA Coordinator (615- 532-0207) for further information. Hearing impaired callers may use the Tennessee Relay Service (800- 848-0298).

If it is hard for you to read, speak, or understand English, TDEC may be able to provide translation or interpretation services free of charge. Please contact Saul Castillo at (615) 532-0462 for more information.

If you have any questions about the proposed revision to the SIP, you may contact Paul LaRock by phone at (615) 532-0093 or by email at paul.larock@tn.gov. Materials concerning the proposed action are available at https://www.tn.gov/environment/ppo-public-participation/ppo-public-participation/ppo-air.html.

Attachment 2

Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance Program in Middle Tennessee

Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance Program in the Middle Tennessee Area

Prepared by:

State of Tennessee
Department of Environment & Conservation
Division of Air Pollution Control
WRS Tennessee Tower
312 Rosa L. Parks Avenue, 15th Floor
Nashville, TN 37243

and

Metro Nashville/Davidson County
Pollution Control Division
Lentz Public Health Center
2500 Charlotte Avenue
Nashville, TN 37209

August 28, 2019
Draft

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List of Acronyms and Abbreviations

AIRS	Aerometric Information Retrieval System
BMP	Beneficiary Mitigation Plan
CAA	Clean Air Act
CO	Carbon monoxide
CMAQ	Community Multi-scale Air Quality
CFR	Code of Federal Regulations
EAC	Early Action Compact
EMT	Environmental Mitigation Trust
EPA	United States Environmental Protection Agency
FR	Federal Register
HPMS	Highway Performance Monitoring System
I/M	Inspection and Maintenance
MOVES	Motor Vehicle Emissions Simulator
NEI	National Emission Inventory
NOx	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NAAQS	National Ambient Air Quality Standards
O_3	Ozone
Pb	Lead
PM	Particulate Matter
$PM_{2.5}$	Particulate Matter less than 10 microns
ppb	Parts per billion
ppm	Parts per million
SEMAP	Southeastern Modeling Analysis and Planning
SIP	State Implementation Plan
SO_2	Sulfur Dioxide
TDEC	Tennessee Department of Environment and Conservation
TDEC-APC	Tennessee Department of Environment and Conservation, Division of Air Pollution Control
TDM	Travel Demand Model
TCA	Tennessee Code Annotated
TN	Tennessee
TPO	Transportation Planning Organization
TVA	Tennessee Valley Authority
VMT	Vehicle Miles Traveled
VOC	Volatile Organic Compound
VW	Volkswagen

1.0 Proposal Summary

The Tennessee Department of Environment and Conservation, Air Pollution Control Division (TDEC-APC) requests the United States Environmental Protection Agency (EPA) remove the requirement for an Inspection and Maintenance (I/M) program for the five-county Middle Tennessee area, which includes Davidson, Sumner, Wilson, Rutherford, and Williamson Counties (hereinafter referred to as the Middle Tennessee area) from Tennessee's State Implementation Plan (SIP). The SIP currently requires the Middle Tennessee area to implement an I/M program. In order to remove the requirement for an I/M program, the TDEC-APC must demonstrate noninterference through a noninterference demonstration pursuant to Clean Air Act (CAA) Section 110(l), which states the following:

> Each revision to an implementation plan submitted by a State under this chapter shall be adopted by such State after reasonable notice and public hearing. The Administrator shall not approve a revision of a plan if the revision would interfere with any applicable requirement concerning attainment and reasonable further progress (as defined in section 7501 of this title), or any other applicable requirement of this chapter.

The information presented in this document will demonstrate that removing the I/M program from Tennessee's SIP will not interfere with attainment or maintenance of the ozone (O_3), fine particulate matter ($PM_{2.5}$), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), carbon monoxide (CO), or lead (Pb) NAAQS.

Furthermore, this demonstration is being submitted in accordance with, and to satisfy, the requirements of the EPA guidance document entitled *Demonstrating Noninterference Under Section 110(l) of the Clean Air Act When Revising a State Implementation Plan* (dated June 8, 2005)*;* hereinafter referred to as the EPA 110(l) guidance.

2.0 Background

The CAA requires the EPA to set National Ambient Air Quality Standards (NAAQS) for six common air pollutants (also known as "criteria air pollutants"). These pollutants are O_3, $PM_{2.5}$, SO_2, NO_2, CO, and Pb. All of the NAAQS will be evaluated in this demonstration; however, ozone will be the primary focus since the I/M program was a control strategy used to attain the ozone NAAQS. The criteria pollutants are found throughout the U.S. and at certain concentrations can be harmful to human health and the environment, and cause property damage. The State of Tennessee is required to develop a State Implementation Plan (SIP) to control air pollution within the state and maintain compliance with the NAAQS standards. In general, the SIP consists of programs, including: air quality monitoring, air quality modeling, emission inventories, emission control strategies, and documents (policies, rules, and plans) that the state uses to attain and maintain the NAAQS. Each area of the country is designated attainment or nonattainment based on whether the area is in compliance with the NAAQS (attainment) or not in compliance with the NAAQS (nonattainment). The Clean Air Act requires the EPA to

periodically review all of the NAAQS to ensure that they provide adequate health and environmental protection, and to update those standards as necessary.

Davidson County implemented an I/M program in response to the designations from the 1977 CAA. Davidson County began emissions testing of light duty vehicles in 1985. The I/M program required all light-duty motor vehicles registered in the Davidson County to be inspected annually for compliance with emissions performance and anti-tampering test criteria. More details of the current I/M program are given at the end of this section.

Ground level ozone is created by chemical reactions between NOx and VOC in the presence of sunlight. The EPA set the ozone NAAQS at 0.12 ppm (parts per million) 1-hour standard on February 8, 1979 (44 Federal Register (FR) 8202). In this document, this will be referred to as the 1979 ozone NAAQS. Although the NAAQS are cited in the federal regulations in units of ppm, the remainder of this document will use units of parts per billion (ppb) for ease of readability. In mathematical terms, 1,000 ppb is equivalent to 1 ppm. In terms of the NAAQS, 0.12 ppm is equivalent to 120 ppb. The passage of the 1990 Clean Air Act Amendments required expansion of the existing I/M program in Davidson County due to the moderate ozone nonattainment classification for the 1-Hour Ozone NAAQS. On November 6, 1991, the EPA designated the Middle Tennessee area as a moderate nonattainment area, which required the implementation of an I/M program (56 FR 56694). This meant that Rutherford, Sumner, Williamson and Wilson counties were also required to implement an I/M program in addition to Davidson County.

The TDEC-APC submitted a SIP to the EPA outlining the specifics of the I/M program for the Middle Tennessee area on July 17, 1994. The SIP was federally approved on September 26, 1995 (60 FR 38694). The I/M program started in Rutherford, Sumner, Williamson and Wilson counties on December 1, 1994. After coming back into compliance with the 1979 ozone NAAQS, the EPA redesignated the Middle Tennessee area as attainment on October 30, 1996 (61 FR 55903). This meant that the Middle Tennessee area was a maintenance area and was still required to have an I/M program.

On July 18, 1997, the EPA revised the NAAQS for ground-level ozone from a 120 ppb 1-hour standard to an 80 ppb 8-hour average standard. In this document, this will be referred to as the 1997 ozone NAAQS. Faced with a possible designation of nonattainment, the Middle Tennessee area entered into a voluntary program called an Early Action Compact (EAC) with the EPA in December 2002. The EPA offered the EAC as an option for reaching attainment earlier than would be required by the CAA's conventional nonattainment route. The EPA offered to defer the effective date of air quality nonattainment designations for these areas if they met the qualifications to participate in the EAC. Specifically, the EPA required development of a plan to bring the area's ozone design value to an attaining level by December 31, 2007. This plan had to contain a modeling demonstration that the area's projected emissions inventory in 2007 would lead to attaining the 8-hour ozone NAAQS. Through the region's efforts to proactively address ozone air quality, a demonstration was made that the area was expected to attain the new standard by December 31, 2007, and maintain it through at least 2017. The ozone NAAQS was revised in 2008 to a value of 75 ppb and again in 2015 to 70 ppb. The Middle Tennessee area

was classified as attainment for the 2008 and 2015 ozone NAAQS. Thus, the Middle Tennessee area is currently in attainment with all of the ozone NAAQS.

The full requirements of the current I/M program are found in Chapter 29 of the Tennessee Air Pollution Control Regulations (TAPCR 1200-03-29). The main requirements of this regulation are presented hereinafter. This regulation specifies an emission limit for CO and hydrocarbon (HC) for gasoline powered light-duty vehicles with a model year from 1975 to 1995. An onboard diagnostics (OBD) inspection is required for 1996 and newer gasoline powered light-duty vehicle and 2002 and newer diesel powered light-duty vehicles. The OBD is a system of vehicle component and condition monitors controlled by a central, onboard computer designed to signal the motorist when conditions exist which could lead to a vehicle's exceeding its certification standards by 1.5 times the Federal Test Procedure (FTP) standard. The FTP is a test procedure used to determine the compliance of vehicles with federal emission standards. The anti-tampering test ensures that the emission control devices (catalytic converter and fuel filler cap) are not in a tampered condition. Essentially, owners of vehicles that fail the emission performance and anti-tampering criteria must repair the vehicle so that it passes the test and can be properly registered in Tennessee. Thus, an I/M program ensures that vehicle emissions of CO, nitrogen oxides (NOx), and volatile organic compounds (VOC) are properly controlled. As a result of the proactive effort, the Middle Tennessee area met the EAC requirements by December 31, 2007, demonstrating attainment with the 8-hour NAAQS of 80 ppb. On April 2, 2008, the EPA designated the Middle Tennessee area as attainment for the ozone NAAQS (73 Federal Register 17897).

On May 15, 2018, a new law (Public Chapter No. 953) was passed in Tennessee that states that "no inspection and maintenance program shall be employed in this state on or after the effective date of this act." The law goes on to say that the requirement for the I/M program would end after the EPA approved a SIP revision showing removal of the I/M program would not interfere with attainment or maintenance of air quality standards. There is a provision in the law that allows any county with a local air pollution control program that implements its own I/M program on the effective date of the law change to continue the program if the governing body acted to do so within thirty (30) days of the effective date of the law change. Thus, the new law is the reason for the request to remove the I/M program from Tennessee's SIP. Appendix A contains the full language of the new law. The new law is codified in Tennessee Code Annotated (TCA) 68-201-119(b), (c) and (d) and 55-4-104. Concurrent with this noninterference demonstration, the TDEC-APC requests that Chapter 29 of the TAPCR and Davidson County's Regulation No. 8 be completely removed from Tennessee's SIP. Appendix B contains the proposed revisions to Chapter 29 and Regulaton No. 8.

3.0 Emission Inventory

This section is divided into six sub-sections as follows:

3.1 Overview of Emission Inventory
3.2 Onroad Mobile Source Emissions
3.3 Nonroad Mobile Source Emissions

3.4 Point Source Emissions
3.5 Nonpoint Emissions
3.6 Total emissions

3.1 Overview of Emission Inventory

If the EPA approves this noninterference demonstration for the removal of the I/M program, it would likely take place in either 2020 or 2021. Thus, emissions in the Middle Tennessee area were projected to 2022 since that would be the first anticipated full calendar year without the I/M program. The starting point for the emission projections for several sectors (nonroad, point, and nonpoint) was the 2014 National Emission Inventory (NEI), version 2. Emissions were then projected to 2022 using different techniques as stated in the subsections for each sector. The onroad emissions were projected using the Motor Vehicle Emissions Simulator (MOVES) model. Two onroad scenarios were modeled: (1) with an I/M program and (2) without an I/M program. Total emissions were then calculated by adding all the sector emissions together.

3.2 Onroad Mobile Source Emissions

This section is divided into three sub-sections as follows
3.2.1 Overview of Onroad Emissions
3.2.2 Onroad Emissions Inventory Development
3.2.3 Onroad Emissions in 2022 and the Estimated Impact of the IM Program

3.2.1 Overview of Onroad Emissions

Onroad mobile sources as an emissions source category is comprised of a large number of individual sources. Onroad mobile sources are all vehicles certified for onroad use. These include, for example, cars, motorcycles, pickup trucks, buses, delivery trucks and long-haul trucks (18 wheelers). As a group, onroad vehicles contribute significant amounts of certain air pollutants. Emissions from onroad sources are estimated through the use of locally gathered information on the vehicle population and the miles driven in each county, as well as a number of other inputs, combined with the EPA's Motor Vehicle Emissions Simulator (MOVES) model. Details on the development of the onroad emissions are contained in Appendices C, D, and E.

3.2.2 Onroad Emissions Inventory Development

The onroad mobile source emissions were developed using the most recent database for the EPA's MOVES2014a model, released in August of 2018. The emissions inventory for onroad sources was developed in conjunction with the Davidson County Metro Health Department Division of Pollution Control and the Nashville Metropolitan Planning Organization (MPO). Development of the onroad emission inventory followed the EPA's Technical Guidance on the use of MOVES for SIP emissions inventory development[1]. Onroad emissions were developed through the use of locally gathered data applied to EPA's Motor Vehicle Emissions Simulator

[1] *MOVES2014, MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emissions Inventories for State Implementation Plans and Transportation Conformity*. US EPA. EPA-420-B-18-039, August 2018.

(MOVES) model. Some of the locally developed data includes vehicles miles travelled (VMT) and vehicle population. Table 1 and Table 2 summarize the VMT and vehicle population in the five Middle Tennessee Counties.

Table 1: Annual Vehicle Miles Traveled for Middle Tennessee Counties in 2022

Middle Tennessee 2022 Annual Vehicle Miles Traveled						
Vehicle Type	MOVES Source Type ID	Davidson	Rutherford	Sumner	Williamson	Wilson
Motorcycle	11	57,713,968	26,292,483	12,155,938	22,386,905	12,586,664
Passenger Car	21	4,634,801,869	1,989,586,973	754,843,360	1,701,881,665	925,300,575
Passenger Truck	31	3,182,297,691	1,408,527,116	538,075,392	1,254,170,726	662,022,498
Light Commercial Truck	32	913,590,380	411,283,269	156,965,408	354,734,966	196,040,173
Intercity Bus	41	63,015	33,036	34,162	27,376	25,002
Transit Bus	42	1,077,154	66,228	-	125,553	-
School Bus	43	649,925	497,666	1,593,460	404,447	363,839
Refuse Truck	51	13,330,589	4,372,578	9,344,581	5,224,103	3,218,185
Single Unit Short-haul Truck	52	319,896,217	102,930,408	293,103,105	89,442,084	62,515,507
Single Unit Long-haul Truck	53	15,865,508	5,199,065	11,868,915	5,803,116	3,611,621
Motor Home	54	11,403,222	3,707,775	8,777,445	4,014,639	2,487,548
Combination Short-haul Truck	61	175,962,149	86,151,150	29,115,618	56,230,707	41,437,374
Combination Long-haul Truck	62	597,742,508	292,225,031	97,610,284	192,506,485	141,754,651
Total:		9,924,394,196	4,330,872,778	1,913,487,668	3,686,952,773	2,051,363,637

Table 2: Source Type Population Projections for the Middle Tennessee Area in 2022

Vehicle Type	MOVES Source Type ID	Source Type Population 2022				
		Davidson	Rutherford	Sumner	Williamson	Wilson
Motorcycle	11	11,233	7,992	5,921	5,845	4,212
Passenger Car	21	324,177	139,019	86,521	136,657	62,003
Passenger Truck	31	206,060	91,902	58,046	90,993	42,052
Light Commercial Truck	32	52,384	23,371	14,751	23,151	10,702
Intercity Bus	41	15	4	1	4	3
Transit Bus	42	403	11	-	27	-
School Bus	43	932	363	281	356	263
Refuse Truck	51	402	138	55	117	76
Single Unit Short-haul Truck	52	12,807	4,869	2,951	3,079	2,527
Single Unit Long-haul Truck	53	589	202	86	160	105
Motor Home	54	3,641	1,239	547	952	622
Combination Short-haul Truck	61	7,285	2,111	606	1,763	1,267
Combination Long-haul Truck	62	7,942	2,298	652	1,937	1,391
Total		627,870	273,519	170,418	265,041	125,223

More detailed information on how onroad emissions were estimated is contained in Appendices C, D, and E.

3.2.3 Onroad Emissions in 2022 and the Estimated Impact of the I/M Program

Table 3 illustrates the onroad emissions for CO, NOx and VOCs in the Middle Tennessee area in 2022 without an I/M Program. Table 4 illustrates the onroad emissions for CO, NOx and VOCs in Middle Tennessee area in 2022 with the current I/M Program. Table 5 illustrates the difference between the two scenarios. This difference is the expected impact of the Middle Tennessee area I/M program in 2022 as generated by the EPA's MOVES model. The difference

in the two scenarios (Table 5) for the onroad sector is a 14.4% increase in CO emissions, a 4.2% increase in NOx emissions, and a 12.4% increase in VOC emissions.

Table 3: Middle Tennessee Area Onroad Emissions without the I/M Program in 2022.

No I/M Scenario in 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------		
Motorcycle	11	1,665.90	93.23	279.85
Passenger Car	21	33,473.99	1,643.96	2,201.84
Passenger Truck	31	34,874.37	2,388.51	2,017.64
Light Commercial Truck	32	5,958.15	358.53	268.97
Intercity Bus	41	0.49	1.18	0.08
Transit Bus	42	5.91	1.70	0.23
School Bus	43	33.94	6.03	1.11
Refuse Truck	51	50.67	128.98	7.96
Single Unit Short-haul Truck	52	3,799.84	1,262.13	213.99
Single Unit Long-haul Truck	53	76.51	89.14	10.52
Motor Home	54	535.11	70.48	27.18
Combination Short-haul Truck	61	537.52	1,528.05	94.75
Combination Long-haul Truck	62	1,171.85	4,215.76	249.21
	Total:	82,184.25	11,787.69	5,373.33

Table 4: Middle Tennessee Area Onroad Emissions with the Current I/M Program in 2022.

Current I/M Scenario 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------		
Motorcycle	11	1,665.90	93.23	279.85
Passenger Car	21	28,863.86	1,449.85	1,919.18
Passenger Truck	31	29,799.75	2,134.39	1,739.09
Light Commercial Truck	32	5,274.62	328.24	237.09
Intercity Bus	41	0.49	1.18	0.08
Transit Bus	42	5.91	1.70	0.23
School Bus	43	33.94	6.03	1.11
Refuse Truck	51	50.67	128.98	7.96
Single Unit Short-haul Truck	52	3,799.84	1,262.13	213.99
Single Unit Long-haul Truck	53	76.51	89.14	10.52
Motor Home	54	535.11	70.48	27.18
Combination Short-haul Truck	61	537.52	1,528.05	94.75
Combination Long-haul Truck	62	1,171.85	4,215.76	249.21
	Total:	71,815.97	11,309.17	4,780.23

Table 5: Benefit of the I/M Program in the Middle Tennessee Area in 2022.

Difference between I/M and no I/M Scenarios in 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------		
Motorcycle	11	0.00	0.00	0.00
Passenger Car	21	4,610.12	194.11	282.66
Passenger Truck	31	5,074.62	254.12	278.55
Light Commercial Truck	32	683.53	30.28	31.89
Intercity Bus	41	0.00	0.00	0.00
Transit Bus	42	0.00	0.00	0.00
School Bus	43	0.00	0.00	0.00
Refuse Truck	51	0.00	0.00	0.00
Single Unit Short-haul Truck	52	0.00	0.00	0.00
Single Unit Long-haul Truck	53	0.00	0.00	0.00
Motor Home	54	0.00	0.00	0.00
Combination Short-haul Truck	61	0.00	0.00	0.00
Combination Long-haul Truck	62	0.00	0.00	0.00
	Total:	10,368.28	478.52	593.10

3.3 Nonroad Mobile Source Emissions

There are several categories of nonroad mobile source emissions. This section is divided into the following sub-sections:

3.3.1 Nine major categories of nonroad mobile source emissions
3.3.2 Marine, Aircraft, and Rail (MAR) sources
3.3.3 Total for Nonroad Mobile Source Emissions

3.3.1 Nine Major Categories of Nonroad Mobile Source Emissions

County-level emission estimates for the 9 major categories of nonroad mobile source emissions were developed using the EPA's 2014 Version 2 NEI. The 9 major categories are listed in Tables 6 and 7. Table 6 shows the baseline emissions in 2014 and Table 7 shows the projected emissions in 2022. Appendix F contains more detailed information.

Table 6: Middle Tennessee Area Nonroad Mobile Source Emissions (9 categories) of CO, NOx, and VOC (in tons per year) for Baseline Year (2014 NEI)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	264	296	32
Commercial Equipment	11,791	507	481
Construction and Mining Equipment	3,802	3,244	494
Industrial Equipment	2,050	599	92
Lawn and Garden Equipment	27,880	451	1,795
Logging Equipment	16.7	1.9	2.1
Pleasure Craft	2,194	198	624
Railroad Equipment	12.3	6.4	1.3
Recreational Equipment	5,845	72	1,756
Total Emissions	53,854	5,376	5,278

Table 7: Middle Tennessee Area Nonroad Mobile Source Emissions (9 categories) of CO, NOx, and VOC (in tons per year) for Projected Future Year (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	79	88	9
Commercial Equipment	9,956	290	353
Construction and Mining Equipment	2,648	1,606	281
Industrial Equipment	1,632	364	55
Lawn and Garden Equipment	27,274	330	1,612
Logging Equipment	9.9	0.5	1.2
Pleasure Craft	1,947	173	323
Railroad Equipment	11.7	3.7	0.8
Recreational Equipment	2,840	33	469
Total Emissions	46,398	2,887	3,104

3.3.2 Marine, Aircraft, and Rail (MAR) Sources

Base year emissions for MAR sources were obtained from the 2014 Version 2 NEI. Emissions were projected to 2022 by growing the base year 2014 emissions by the appropriate EPA growth factors over an 8 year span. For source codes with no known growth factor, a 3 percent increase was applied to the base year 2014 emissions. Appendix G contains more detailed information.

Table 8: Middle Tennessee Area Nonroad Mobile Source Emissions (MAR) of CO, NOx, and VOC (in tons per year) for Baseline Year (2014 NEI) and Projected Future Year (2022)

MAR Source Type	2014 NEI V2			2022 Projection		
	CO	NO_X	VOC	CO	NO_X	VOC
Rail	298	2,055	106	229	1,570	82
Marine	30	107	11	34	123	12
Airport	2,314	800	243	2,444	833	254
Total Emissions	2,642	2,963	360	2,707	2,527	347

3.3.3 Total for Nonroad Mobile Source Emissions

Table 9 shows the total emissions for the nonroad mobile sources sector, which includes the 9 major nonroad categories, as well as mobile, aircraft, and rail emissions.

Table 9: Middle Tennessee Area Total Nonroad Mobile Source Emissions of CO, NOx, and VOC (in tons per year) for Baseline Year (2014 NEI) and Projected Future Year (2022)

	2014 NEI V2			2022 Projection		
	CO	NO_X	VOC	CO	NO_X	VOC
Total Emissions	56,497	8,339	5,638	49,105	5,413	3,451

3.4 Point Source Emissions

Point source emissions for Sumner, Wilson, Rutherford, and Williamson Counties were obtained from the 2014 Version 2 NEI. For these four counties, only facilities with a Major Source Permit[2] and actual emissions of CO, NOx, or VOC greater than 100 tons per year were included. Metro Nashville/Davidson County Pollution Control Division provided emission data for all point sources in Davidson County for 2017. In the table below, these sources are grouped together as "Davidson County Facilities". Appendix H contains more detailed information about the Davidson County facilities. Except for the four facilities mentioned below, future-year emissions were developed by growing the base year 2014 or 2017 emissions by the appropriate EPA growth factors, or, for sources with no known growth factor, using engineering judgement. Appendix I contains details on how 2022 projections were developed for BFI Waste Systems, Bridgestone, Hoeganaes, and TVA Gallatin.

Table 10: Middle Tennessee Area Point Source Emissions for CO, NOx, and VOC (in tons per year) of Baseline and Projected Future (2022)

Facility	Baseline			2022 Projection		
	CO	NO_X	VOC	CO	NO_X	VOC
BFI Waste Systems of Tennessee, LLC	133	24	25	186	34	29
Bridgestone Americas Tire Operations, LLC	27	26	204	27	26	204
Nissan North America, Inc.	58	52	2,377	52	47	2,237
Hoeganaes Corporation	793	95	7	751	90	6
TVA Gallatin Fossil Plant	884	5,106	106	873	1,143	103
Midwestern Gas Transmission, Station 2101	41	529	20	44	572	21
Tennessee Gas Pipeline Company, LLC	101	921	60	105	976	59
Davidson County Facilities	531	1,286	1,004	657	1,567	1,208
Total Emissions	2,568	8,040	3,803	2,696	4,455	3,867

3.5 Nonpoint Emissions

For the nonpoint emission inventory, fourteen categories were determined to be contributors to the particular pollutants of interest, i.e. CO, NOx, and VOC. The development of the nonpoint emission inventory was completed by following the EPA's established methodologies that are laid out in the nonpoint tools published by the EPA and available on the NOMAD Sharepoint website. The fourteen categories are listed in Tables 11 and 12. Table 11 shows the baseline emissions in 2014, and Table 12 shows the projected emissions in 2022. Appendix J contains a description of each of the fourteen categories and the methodology used for projecting emissions to 2022.

[2] Major (or Title V) Source Permits are issued to facilities with potential emissions over 100 tons per year of an air contaminant or 10 tons/year for a single "hazardous air pollutants" (HAP) or 25 tons/year for any combination of HAP's.

Table 11: Middle Tennessee Area Nonpoint Emissions for CO, NOx, and VOC (in tons per year) of Baseline (2014 NEI)

Category	**CO**	**NOx**	**VOC**
Agricultural Livestock	0	0	37
Agricultural Pesticides	0	0	57
Asphalt Paving	0	0	226
Aviation Gasoline	0	0	101
Commercial Cooking	121	0	44
Composting	0	0	154
Gasoline Stage 1 Distribution	0	0	2,175
Human Cremation	0.03	6.79	0.02
Open Burning	31,113	963	2,141
Residential Heating	383	919	53
Industrial, Commercial, & Institutional Fuel Combustion	3,062	1,684	103
Residential Wood Combustion	3,769	66	623
Residential Charcoal Grilling	2,929	63	55
Solvents	0	0	13,948
Total Emissions	41,375	3,702	19,716

Table 12: Middle Tennessee Area Nonpoint Emissions of CO, NOx, and VOC (in tons per year) for Projected Year 2022

Category	**CO**	**NOx**	**VOC**
Agricultural Livestock	0	0	39
Agricultural Pesticides	0	0	57
Asphalt Paving	0	0	329
Aviation Gasoline	0	0	102
Commercial Cooking	138	0	51
Composting	0	0	163
Gasoline Stage 1 Distribution	0	0	2,527
Human Cremation	0.03	6.61	0.02
Open Burning	35,401	1,098	2,465
Residential Heating	382	919	53
Industrial, Commercial, & Institutional Fuel Combustion	2,153	1,336	79
Residential Wood Combustion	4,722	79	750
Residential Charcoal Grilling	3,036	65	57
Solvents	0	0	16,018
Total Emissions	45,833	3,504	22,690

3.5 Total Projected Emissions

The total projected emissions in 2022 were calculated by adding the four sectors (onroad, point, nonroad, and non-point) together. Table 13 shows the total projected emission in 2022 with the I/M program. Table 14 shows the total projected emissions in 2022 without the I/M program. Since the I/M program only effects emissions in the onroad sector, the projected emissions in the other sectors (point, nonroad, and non-point) are the same between the "with the I/M program" and the "without the I/M program" scenarios.

The difference in the two scenarios for the onroad sector is a 10,368.28 ton per year increase in CO emissions, a 478.52 ton per year increase in NOx emissions, and a 593.1 ton per year increase in VOC emissions. On a percentage basis, the difference in the two scenarios for the onroad sector is a 14.4% increase in CO emissions, a 4.2% increase in NOx emissions, and a 12.4% increase in VOC emissions. The difference in the two scenarios for all four sectors combined is a 6.1% increase in CO emissions, a 1.9% increase in NOx emissions, and a 1.7% increase in VOC emissions. These small increases in NOx and VOC emissions are not expected to significantly increase ozone concentrations. The Conclusion Section of this document further discusses the implications of these emission increases.

Table 13: Middle Tennessee Area Total Projected Emissions of CO, NOx, and VOC (in tons per year) in Projected Year 2022 with the I/M Program

Sector	**CO**	**NO_X**	**VOC**
Onroad	71,816	11,309	4,780
Point	2,696	4,455	3,867
Nonroad	49,105	5,413	3,451
Non-Point	45,833	3,504	22,690
Total Emissions	169,450	24,681	34,788

Table 14: Middle Tennessee Area Total Projected Emissions of CO, NOx, and VOC (in tons per year) in Projected Year 2022 without the I/M Program

Sector	**CO**	**NO_X**	**VOC**
Onroad	82,184	11,788	5,373
Point	2,696	4,455	3,867
Nonroad	49,105	5,413	3,451
Non-Point	45,833	3,504	22,690
Total Emissions	179,818	25,160	35,382

4.0 Sensitivity of Ozone to NOx and VOC Emissions

To quantify the potential impact of removal of the I/M program, the TDEC-APC completed a photochemical modeling sensitivity analysis. The analysis presented in this section is included as additional weight of evidence to show that the emissions increases resulting from removal of the I/M program will have an insignificant to no impact on ozone concentrations in the Middle Tennessee area. VOC's and nitrogen oxides (NOx) are both precursors to the formation of tropospheric ozone. In the Southeast United States, it has been determined that NOx emissions are the primary emissions source for the production of ground-level ozone. Thus, lowering NOx emissions is more effective in controlling ozone formation than lowering VOC emissions. Stated another way, ozone formation in the Southeast United States is NOx limited, meaning that changes in the VOC concentration result in little to no change in ozone concentration. This is due to high biogenic (naturally occurring from vegetation) VOC emissions compared to anthropogenic (human caused) VOC emissions in the Southeast United States.

As part of the Southeastern Modeling Analysis and Planning (SEMAP) project, Georgia Institute of Technology performed an analysis of the sensitivity of ozone concentrations in the Eastern U.S. to reductions in emissions of both NOx and VOCs. This analysis was based off of the 2007 and 2018 SEMAP modeling which used the Community Multi-scale Air Quality (CMAQ) model, version 5.01 with updates to the vertical mixing coefficients and land-water interface. This analysis focuses on the part of the ozone season (May 1 through September 30), which was modeled using a 12-km modeling grid that covered the Eastern U.S.

Sensitivities were modeled relative to 2018 emissions to evaluate the impact of NOx and VOC reductions on daily 8-hour maximum ozone concentrations. Each emissions sensitivity run reduced the 2018 anthropogenic NOx or VOC emissions (point, area, mobile, non-road, marine/aircraft/rail) within a specific geographic region by 30%. The TDEC-APC examined the normalized sensitivities of NOx and VOC emissions (in Table 15) on 8-hour daily maximum ozone concentrations (ppb ozone/TPD) at five ozone monitors in the Middle Tennessee area. Appendix K contains further details on the approach used to calculate the normalized sensitivities of NOx and VOC as contributors to ozone formation. The results in Table 15 show that NOx emissions reductions are more effective than VOC emissions reductions at reducing ozone concentrations.

Table 15: Normalized Sensitivities of NOx and VOC Emissions on 8-hour Daily Maximum Ozone Concentrations (ppb ozone/TPD)

Site ID	Location	Site Name	30% NOx (ppb/TPD)	30% VOC (ppb/TPD)
47-037-0026	Davidson County	Percy Priest	-0.1942	-0.00481
47-037-0011	Davidson County	Trinity Lane	-0.1835	-0.00547
47-165-0007	Sumner County	Rockland Recreation Area	-0.1491	-0.00014
47-187-0106	Williamson County	Fairview Middle School	-0.1413	-0.00028
47-189-0103	Wilson County	Cedars of Lebanon State Park	-0.1363	0.00017
		Average	-0.1609	-0.00210

Although the SEMAP study projected emissions and ozone concentrations in 2018, it is estimated that a similar response to NOx and VOC reductions would occur in 2022. In order to look at the impact of the removal of the I/M program, the site-specific normalized sensitivities are multiplied by the increase in NOx and/or VOC emissions. The site-specific normalized NOx and VOC sensitivities were applied to the expected emissions increases due to the removal of the I/M program. The emissions increases are based on 2022 values. As stated in Section 3.5, the removal of the I/M program results in an increase in NOx emissions of 478.52 tons per year and VOC emissions of 593.1 tons per year in 2022. A simple average of these totals results in an increase in NOx emissions of 1.311 tons per day and VOC emissions of 1.625 tons per day in 2022. Although these values represent an average day and the SEMAP project used an ozone season day, it is expected that the increase in emissions on an average day and an ozone season day would be similar and would not change the conclusions drawn from this sensitivity analysis.

The corresponding ozone increases at each monitor are found in Table 16 and demonstrate a very small increase in ozone concentrations. The highest increase was 0.262 ppb at the Percy Priest monitor (AIRS ID 47-037-0026). The calculated changes in ozone levels are well below the level of precision of the ambient ozone monitors (1 ppb).

Table 16: Emissions Increases Due to the I/M Program Removal and Effects on Ozone Formation

AIRS ID	2022 NO_X Emissions Increase (tons/day)	Corresponding O_3 Increase at Monitor due to NO_X Increase (ppb)	2022 VOC Emissions Increase (tons/day)	Corresponding O_3 Increase at Monitor due to VOC Increase (ppb)	Corresponding O_3 Increase at Monitor due to combined NOx and VOC increases (ppb)
47-037-0026	1.311	0.25454	1.625	0.00782	0.262
47-037-0011	1.311	0.24059	1.625	0.00888	0.249
47-165-0007	1.311	0.19545	1.625	0.00022	0.196
47-187-0106	1.311	0.18518	1.625	0.00045	0.186
47-189-0103	1.311	0.17865	1.625	-0.00028	0.178

5.0 Court Settlements

There are decreases in emission from actions taken or proposed to be taken relating to two court settlements that will potentially affect ambient air in the Middle Tennessee area. This noninterference demonstration does not rely on these settlements in any way to quantify air quality changes, but includes them to show that there have recently been large NOx decreases in the power sector, and there will be additional future NOx decreases anticipated in the onroad sector. This provides further weight of evidence to show that the emissions increases resulting

from removal of the I/M program will have insignificant to no impact on ozone concentrations in the Middle Tennessee area.

This section is divided into the following subsections:

5.1 TVA settlement
5.2 VW settlement

5.1 TVA Settlement

The largest source of NOx emissions in Tennessee is Electric Generating Units (EGU's), which are all owned by the Tennessee Valley Authority (TVA). The TVA entered into a court settlement in 2011 for previous violations of the Clean Air Act. This settlement required shut downs, new controls, and a switch from coal to natural gas at certain facilities. Some of these changes have taken place, some are on-going, and some will take place in the near future. Specifically, the following changes have been implemented:

- Shut down of the TVA Allen coal plant in Shelby County, which was replaced by a natural gas plant on the same site. The coal-fired units were retired before June, 2018
- Shut down of the TVA Johnsonville coal plant in Humphreys County. The tenth and final coal-fired unit was retired December 31, 2017
- Addition of selective catalytic reduction (SCR) controls at the TVA Gallatin coal plant in Sumner County. All SCRs were installed and operational by December, 2017

In addition to the settlement agreement, the TVA has recently started producing electricity from Watts Bar 2 nuclear plant in Rhea County, which could decrease power production from the TVA fossil fuel-fired facilities. Also, on February 14, 2019, the TVA Board of Directors approved the retirement of the TVA Bull Run coal plant in Anderson County, which would take place as early as 2023.

The calculation of the ozone NAAQS design value (which will be discussed in more detail in Section 6.1 of this document) is averaged across three consecutive years. The changes to the TVA facilities listed above that occurred in 2017 and 2018 would affect the 2019 ozone design value, which is the average of ozone values for 2017, 2018, and 2019; and these changes would also affect the 2020 ozone design value, which is the average of ozone values for 2018, 2019, and 2020. Thus, changes at TVA facilities that have already been completed will affect the ozone design values for several years after the change.

In summary, there will be benefits in the Middle Tennessee area from NOx reductions in other parts of Tennessee and neighboring states due to decreases in the transport of ozone and ozone precursors from outside the Middle Tennessee area.

5.2 VW Settlement

In 2015, Volkswagen (VW) publicly admitted that it had secretly and deliberately installed a defeat device—software designed to cheat emissions tests and deceive federal and state

regulators—in approximately 590,000 model year 2009 to 2016 motor vehicles containing 2.0 and 3.0 liter diesel engines. The United States Department of Justice (DOJ) filed a complaint against VW, alleging that the company had violated the Clean Air Act. In October 2016 and May 2017, the U.S. District Court, Northern District of California ("Court"), approved two partial settlements related to the affected 2.0 and 3.0 liter vehicles, respectively, totaling $14.9 billion ("the VW Settlement"). The VW Settlement will be implemented through the First Partial Consent Decree and Second Partial Consent Decree. Under these consent decrees, VW has agreed to: (1) dedicate $10 Billion to the recall of at least 85% of the affected 2.0 and 3.0 liter vehicles; (2) invest $2 Billion in zero-emission vehicle infrastructure and promotion ("Zero Emission Vehicle Investment Plan"); and (3) establish a $2.9 Billion Environmental Mitigation Trust (EMT) to mitigate the environmental effects of the excess nitrogen oxide (NOx) emissions from the affected vehicles.

The purpose of the EMT is to execute environmental mitigation projects that reduce emissions of NOx. In accordance with the EMT goal, the State of Tennessee's overall goal in administering its EMT allocation is to reduce NOx emissions by targeting the largest contributors of mobile NOx emissions in Tennessee: the on-road, diesel heavy duty sector (33% of mobile NOx emissions) and the on-road, non-diesel light duty sector (40% of mobile NOx emissions). As NOx emissions contribute to the formation of ozone and particulate matter, reductions in NOx emissions will assist in the State's efforts to maintain compliance with the NAAQS for Ozone and Particulate Matter less than 2.5 micrometers in diameter ($PM_{2.5}$).

The State of Tennessee released the final Beneficiary Mitigation Plan (BMP) on September 21, 2018, for implementing the State's initial allocation from the VW EMT. Project solicitations have already begun, and once implemented NOx and PM reductions will then be realized. Although onroad emission sources in the Middle Tennessee area may only receive some of the BMP allocation, there will be benefits in the Middle Tennessee area from NOx reductions in other parts of Tennessee and the Southeast United States due to decreases in the formation and transport of ozone and ozone precursors from outside the Middle Tennessee area.

6.0 Ambient Air Quality Monitoring

Ambient air quality monitoring refers to outdoor monitors that collect air samples, determine the chemical properties of the air sample, and record the data. The data is computed in several different ways to arrive at a design value. Air monitors are located across Tennessee with several monitors located in the Middle Tennessee area. This section gives the ozone and $PM_{2.5}$ data collected at these monitors. This section contains four subsections:

6.1 Ozone
6.2 $PM_{2.5}$
6.3 NO_2
6.4 CO

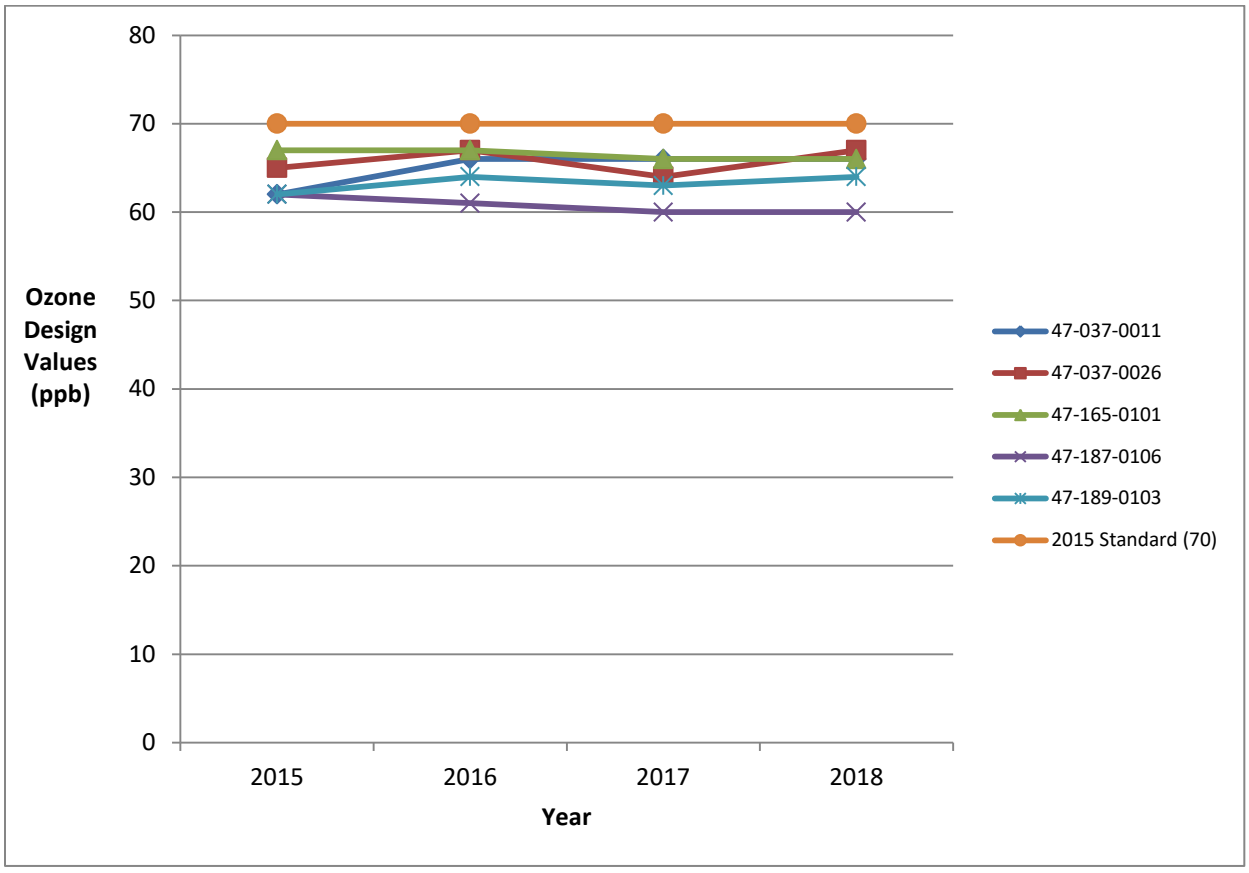
6.1 Ozone

The 2015 ozone NAAQS is 70 ppb. The ozone design value is the fourth–highest daily maximum, averaged across three consecutive years. The daily maximum has an averaging time of eight hours. In any given year, the design value for the area is determined from the monitor with the highest ozone design value in the Middle Tennessee area. Ambient air quality monitoring for ozone is being conducted at five locations in the Middle Tennessee area. The data in Table 17 shows that the five monitors have shown compliance with this standard in 2015, 2016, 2017, and 2018. For 2018, the Percy Priest monitor reflects the highest design value for the area.

Table 17: Ozone Design Values (DV in ppb)

AIRS ID	Site Name	2015	2016	2017	2018
47-037-0011	Trinity Lane	62	66	66	66
47-037-0026	Percy Priest	65	67	64	67
47-165-0101	Rockland Recreation Area	67	67	66	66
47-187-0106	Fairview Middle School	62	61	60	60
47-189-0103	Cedars of Lebanon State Park	62	64	63	64

Figure 1: Ozone Design Values (in ppb) for 2015-2018



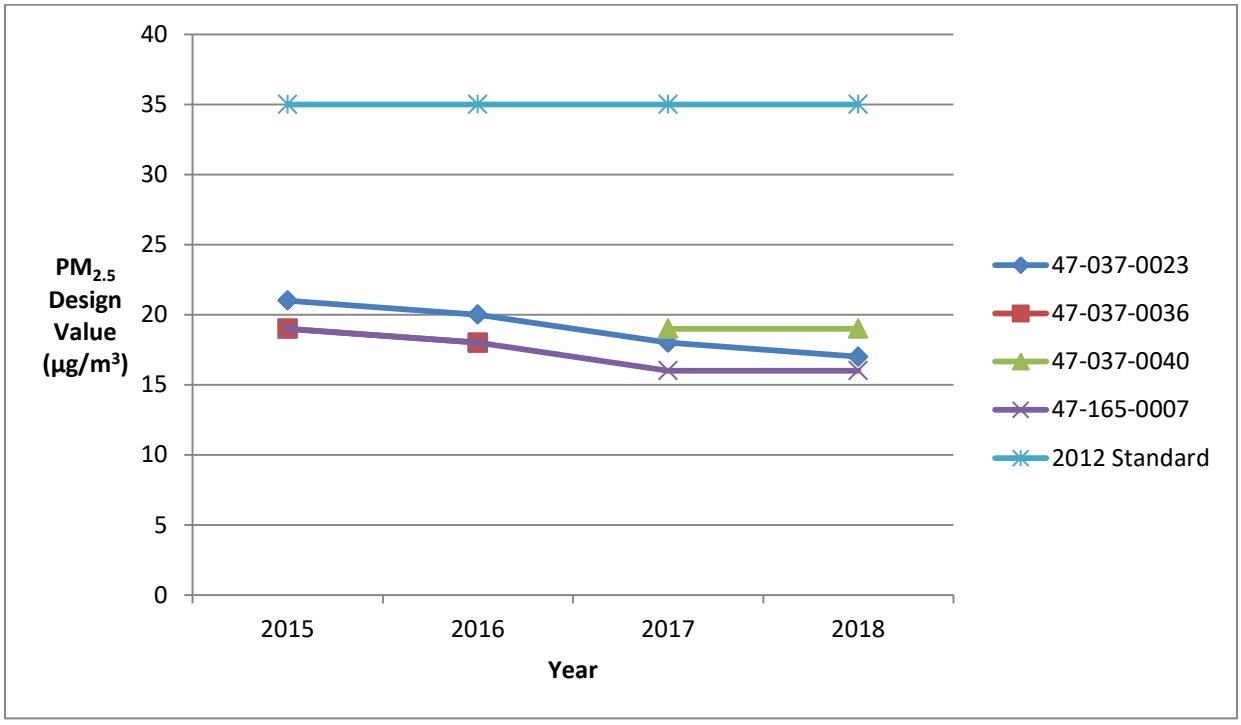
6.2 Particulate Matter

Ambient air quality monitoring for fine particulate matter ($PM_{2.5}$) has been conducted at three locations in the Middle Tennessee area. The 2012 $PM_{2.5}$ 24-hour NAAQS is 35 µg/m^3. The 2012 $PM_{2.5}$ annual NAAQS is 12.0 µg/m^3. The $PM_{2.5}$ 24-hour NAAQS design value is the 98th percentile value, averaged across three consecutive years. The $PM_{2.5}$ annual NAAQS design value is the annual mean averaged across three consecutive years. The details of calculating the $PM_{2.5}$ 24-hour and annual design values are found in Appendix N of 40 CFR 50. The data in Tables 18 and 19 shows that the four monitors show compliance with the $PM_{2.5}$ standards during the time period 2015-2018[3].

Table 18: $PM_{2.5}$ 24-hour Design Values (µg/m^3) for 2015-2018

AIRS ID	2015	2016	2017	2018
47-037-0023	21	20	18	17
47-037-0036	19	18		
47-037-0040			19	19
47-165-0007	19	18	16	16
2012 Standard	35	35	35	35

Figure 2: $PM_{2.5}$ 24-hour Design Values (in µg/m^3) for 2015-2018

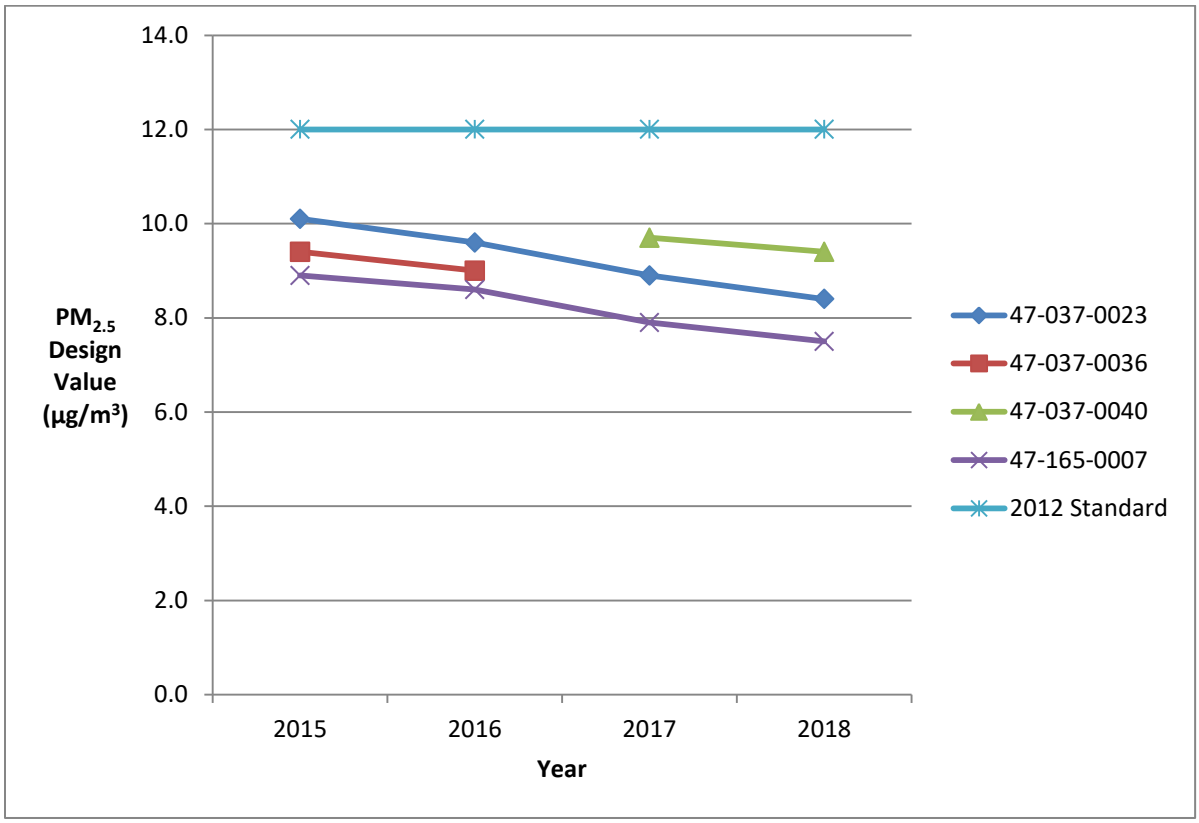


[3] Due to issues with the laboratory analysis of samples, there is no valid design value data for 2012-2014. Site 47-037-0036 stopped operation at the end of 2016. Site 47-037-0040 started operation in 2017; thus, the design value in 2017 represents only 2017 data and the design value for 2018 represents the average of 2017 and 2018 data.

Table 19: $PM_{2.5}$ Annual Design Values ($\mu g/m^3$) for 2015-2018

AIRS ID	2015	2016	2017	2018
47-037-0023	10.1	9.6	8.9	8.4
47-037-0036	9.4	9.0		
47-037-0040			9.7	9.4
47-165-0007	8.9	8.6	7.9	7.5
2012 Standard	12.0	12.0	12.0	12.0

Figure 3: $PM_{2.5}$ Annual Design Values ($\mu g/m^3$) for 2015-2018



6.3 Nitrogen Dioxide

Ambient air quality monitoring for nitrogen dioxide (NO_2) has been conducted at two locations in Davidson County. The NO_2 1-hour NAAQS is 100 ppb. The NO_2 1-hour NAAQS design value is the 98th percentile of 1-hour daily maximum concentrations averaged across three consecutive years. The NO_2 annual NAAQS is 53 ppb. It is simply the annual mean. The details of calculating the NO_2 1-hour and annual design values are found in Appendix S of 40 CFR 50. The data in Tables 20 and 21 shows that the two monitors show compliance with the NO_2 standards during the time period 2016-2018

Table 20: NO_2 1-hour Design Values (ppb) for 2016-2018

AIRS ID	2016	2017	2018
47-037-0011	39	39	36
47-037-0040	53	53	51
Standard	100	100	100

Figure 4: NO_2 1-hour Design Values (ppb) for 2016-2018

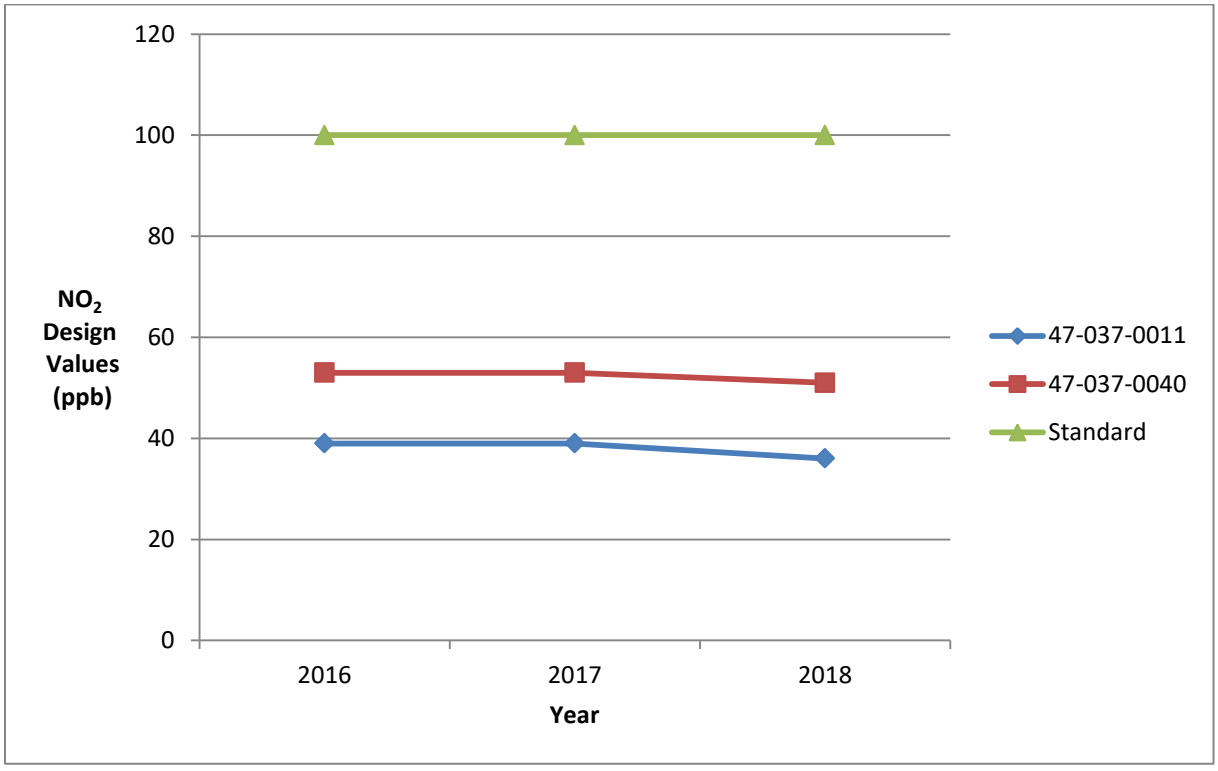
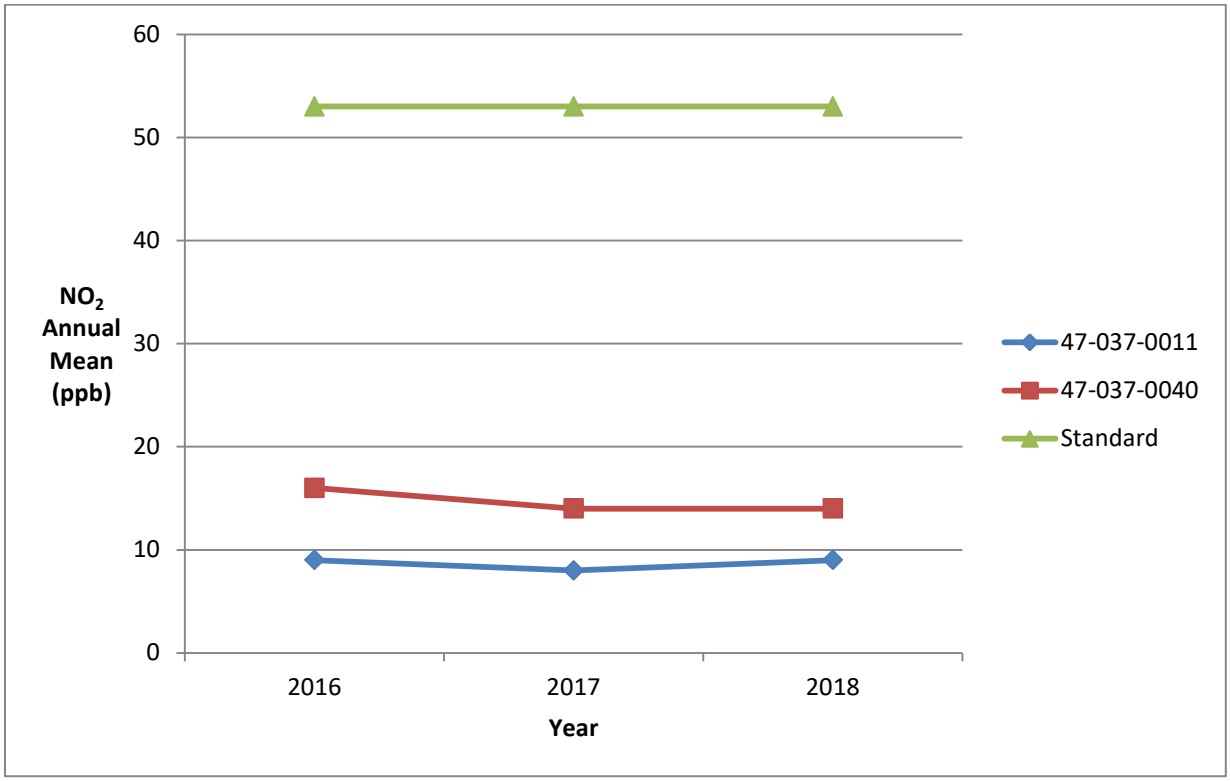


Table 21: NO_2 Annual Mean (ppb) for 2016-2018

AIRS ID	2016	2017	2018
47-037-0011	9	8	9
47-037-0040	16	14	14
Standard	53	53	53

Figure 5: NO_2 Annual Mean (ppb) for 2016-2018



6.4 Carbon Monoxide

Ambient air quality monitoring for carbon monoxide (CO) has been conducted at one location in the Middle Tennessee area. The site is located in Davidson County with an AIRS ID 47-037-0040. The CO 1-hour NAAQS is 35 ppm, and the 8-hour NAAQS is 9 ppm. These values are not to be exceeded more than once per year. Ambient CO levels are well below the two standards. The maximum 1-hour value was 1.8 ppm in 2016, 1.9 ppm in 2017, and 1.9 ppm in 2018. These values show compliance with both standards.

7.0 Conclusion

This section is divided into eight sub-sections as follows:

7.1 Overview
7.2 Ozone NAAQS
7.3 $PM_{2.5}$ NAAQS
7.4 SO_2 NAAQS
7.5 NO_2 NAAQS
7.6 CO NAAQS
7.7 Pb NAAQS
7.8 Final Conclusion

7.1 Overview

The I/M program started in Davidson County in 1985, and it started in Sumner, Wilson, Rutherford, and Williamson Counties in 1994. In May 2018, a new law in Tennessee was passed that called for the end of the I/M program after the EPA approved a SIP revision. As such, the TDEC-APC is submitting this noninterference demonstration, which is required by the CAA, in order to revise the SIP to remove the I/M program in the Middle Tennessee area.

TDEC-APC developed an emission inventory that projected emissions of CO, NOx, and VOC to a future year of 2022, which is anticipated to be the first full year after the I/M program ends. Onroad mobile source emissions were projected for the two scenarios (1) with an I/M program and (2) without an I/M program. Since the I/M program was implemented to help attain the ozone standard, the NOx and VOC emissions were the most important pollutants to examine; especially, NOx emissions since the Southeast is NOx limited.

As stated previously in this document, the EPA sets NAAQS for six "criteria air pollutants", which are O_3, $PM_{2.5}$, SO_2, NO_2, CO, and Pb. This section of the document will discuss the effect on the NAAQS of removing the I/M program, which would cause an increase in emissions of CO, NOx and VOC. Specifically, in the onroad sector there would be a 14.4% increase in CO emissions, a 4.2% increase in NOx emissions, and a 12.4% increase in VOC emissions. For all four sectors (onroad, nonroad, point, and non-point) combined, there would be a 6.1% increase in CO emissions, a 1.9% increase in NOx emissions, and a 1.7% increase in VOC emissions.

The results of a sensitivity analysis based on previously conducted photochemical modeling show that the emissions increases of NOx and VOC resulting from removal of the I/M program would only increase the ozone design value by approximately 0.26 ppb at the highest design value monitor.

A court settlement with the TVA has driven NOx emission down across Tennessee over the past several years and ensures that these emissions will stay at historically low levels. Additionally, a court settlement with VW will bring additional NOx emission decreases across the state.

7.2 Ozone NAAQS

Ground level ozone is created by chemical reactions between NOx and VOC in the presence of sunlight. The removal of the I/M program would cause an increase in both NOx and VOC emissions. Ambient air monitoring shows that the ozone design value for the Middle Tennessee area in 2018 is 67 ppb, which is below the NAAQS of 70 ppb. In section 4.0 of this document, the results of a sensitivity analysis showed only a very small increase (0.26 ppb) in the ozone value in any given year. If the increase in ozone (0.26 ppb) from the sensitivity analysis was added to the current ozone design value (67 ppb) then the result (67.26 ppb) would be less than the current NAAQS of 70 ppb. The small increases in NOx (by 1.9%) and VOC (by 1.7%) emissions are expected to only cause a very small increase in the ozone design value. Therefore, removing the I/M program will not interfere with continued attainment or maintenance of the NAAQS for ozone.

7.3 $PM_{2.5}$ NAAQS

Particulate matter (PM) is found in many sizes and shapes and can be made up of hundreds of different chemicals. For example, $PM_{2.5}$ is formed in the atmosphere as directly emitted NOx reacts with other compounds to form $PM_{2.5}$. NOx compounds that are considered $PM_{2.5}$ only comprise a fraction of the total $PM_{2.5}$. Ambient air monitoring shows that $PM_{2.5}$ 24-hour design value for the Middle Tennessee area in 2018 is 17 $\mu g/m^3$, which is below the 24-hour NAAQS of 35 $\mu g/m^3$. Also, the annual design value in 2018 is 8.4 $\mu g/m^3$, which is below the annual NAAQS of 12.0 $\mu g/m^3$. The small increase in NOx (by 1.9%) emissions is expected to only cause a small increase in the $PM_{2.5}$ design value. Therefore, removing the I/M program will not interfere with attainment or maintenance of the NAAQS for $PM_{2.5}$.

7.4 SO_2 NAAQS

The removal of the I/M program would not cause an increase in emissions of SO_2. Therefore, removing the I/M program will not interfere with attainment or maintenance of the NAAQS for SO_2.

7.5 NO_2 NAAQS

The removal of the I/M program would cause an increase in NOx. NO_2 is one of a group of highly reactive gases known as NOx. Ambient air monitoring shows that the 1-hour design value and annual mean are well below the NAAQS in 2018. Therefore, removing the I/M program will not interfere with attainment or maintenance of the NAAQS for NO_2.

7.6 CO NAAQS

The removal of the I/M program would cause an increase in emissions of CO (by 6.1%). Ambient air monitoring shows that the CO values are well below the 1-hour and 8-hour NAAQS in 2018. Therefore, removing the I/M program will not interfere with attainment or maintenance of the NAAQS for CO.

7.7 Pb NAAQS

Effective January 1, 1996, the CAA banned the sale of the small amount of leaded fuel that was still available in some parts of the country for use in onroad vehicles. Since there is no lead in fuels for onroad vehicles, the removal of the I/M program would not cause an increase in emissions of Pb. Therefore, removing the I/M program will not interfere with attainment or maintenance of the NAAQS for Pb.

7.8 Final Conclusion

Currently, there are no nonattainment areas in the Middle Tennessee area for O_3, $PM_{2.5}$, SO_2, NO_2, CO, or Pb. Monitoring data shows that the Middle Tennessee area is meeting the 2015 ozone standard of 70 ppb, the 2012 $PM_{2.5}$ 24-hour standard of 35 $\mu g/m^3$, the 2012 $PM_{2.5}$ annual standard of 12.0 $\mu g/m^3$, the NO_2 1-hour standard of 100 ppb, the NO_2 annual mean standard of 53 ppb, the CO 1-hour standard of 35 ppm, and the CO 8-hour standards of 9 ppm.

The information presented in this document demonstrates that removing the I/M program will not interfere with continued attainment or maintenance of the NAAQS for O_3, $PM_{2.5}$ SO_2, NO_2, CO, or Pb. The TDEC-APC requests from the EPA the removal of the I/M program requirement in the SIP for the Middle Tennessee area.

Appendix A

Tennessee Law, Public Chapter No. 953

State of Tennessee

PUBLIC CHAPTER NO. 953

HOUSE BILL NO. 1782

By Representatives Carter, Madam Speaker Harwell, McCormick, Gravitt, Hazlewood, Favors, Lamberth, Dawn White, Sparks, Terry, Rudd, Lynn, Boyd, Howell, Faison, Williams, Mark White, Tillis

Substituted for: Senate Bill No. 2656

By Senators Watson, Gardenhire, Ketron, Haile, Pody, Johnson, Kelsey, Stevens

AN ACT to amend Tennessee Code Annotated, Title 55 and Title 68, relative to motor vehicle inspection requirements.

BE IT ENACTED BY THE GENERAL ASSEMBLY OF THE STATE OF TENNESSEE:

SECTION 1. Tennessee Code Annotated, Section 68-201-119, is amended by designating the current language as subsection (a) and by adding the following language as a new subsection (b):

(b)

(1) Notwithstanding subsection (a) or any other law to the contrary, no inspection and maintenance program shall be employed in this state on or after the effective date of this act, except in accordance with Section 2.

(2) If at any time under the federal Clean Air Act, compiled in 42 U.S.C. § 7401 et seq., an inspection and maintenance program is mandated instead of available as a voluntary state implementation plan measure in any county of this state, then subdivision (b)(1) shall not apply in that county.

SECTION 2. An inspection and maintenance program may be employed in a county that, on the effective date of this act, has a local air pollution control program and implements its own inspection and maintenance program, if the county authorizes the continuation of its own inspection and maintenance program by action of its governing body; provided, that in order to authorize the continuation of the inspection and maintenance program, the governing body must authorize the continuation within thirty (30) days of the effective date of this act, and the presiding officer of the county governing body must furnish a certified copy of the approved resolution to the technical secretary of the air pollution control board within sixty (60) days of the effective date of this act.

SECTION 3. The Tennessee air pollution control board is authorized to promulgate rules to effectuate the purposes of this act. All such rules shall be promulgated in accordance with the Uniform Administrative Procedures Act, compiled in Tennessee Code Annotated, Title 4, Chapter 5.

SECTION 4. Any new contract between the department or a local government and a contractor providing inspection services, any new contract between a local government and the department relative to the inspection and maintenance program, and any renewals of such contracts occurring after the effective date of this act, shall include a provision stating that the contract must conform to any changes in state law. Any existing contracts as described in this section shall be amended to include a provision stating that the contract must conform to any changes in state law.

SECTION 5. Tennessee Code Annotated, Section 55-4-104, is amended by adding the following as a new subsection:

( ) Any county that ceases to have an inspection and maintenance program pursuant to Section 1(b)(1) of this act may, by action of its governing body, increase the amount of any clerk's fee imposed on any initial registration, or at the time of renewal, by

an amount up to four dollars ($4.00). Of any increase up to four dollars ($4.00), the clerk shall retain one dollar ($1.00) and remit, as directed by the county governing body, the balance of any funds to the county general fund.

SECTION 6 Any fee increase promulgated by the air pollution control board in order to offset any revenue lost as the result of the implementation of this act shall not be imposed on major sources of air pollutants under Title V of the Clean Air Act (42 U.S.C. § 7401 et seq.) except to the extent that such fees are used to pay for indirect and direct costs related to the Title V program as provided in Title 68, Chapter 203 and 42 U.S.C. § 7661a, and indirect and direct costs specified in 40 CFR § 70.9.

SECTION 7. If any provision of this act or its application to any person or circumstance is held invalid, then the invalidity shall not affect other provisions or applications of the act that can be given effect without the invalid provision or application, and to that end the provisions of this act shall be severable.

SECTION 8.

(a) Section 1 shall take effect one hundred twenty (120) calendar days following the date on which the United States environmental protection agency (EPA) approves a revised state implementation plan consistent with this act, the public welfare requiring it; provided, however, that if on such date, a contract exists between the department and a contractor providing inspection services, then Section 1 shall take effect upon the date of the contract's termination or expiration, the public welfare requiring it. For all other purposes, this act shall take effect upon becoming a law, the public welfare requiring it.

(b)

(1) The commissioner of environment and conservation shall certify in writing to the executive secretary of the Tennessee code commission the date of the approval by the EPA described in Section 6(a) and provide the executive secretary of the commission with a copy of such approval.

(2) If a contract exists on the date one hundred twenty (120) calendar days following the date of approval of the revised state implementation plan, then the commissioner shall also certify in writing the date of the department's contract termination or expiration, and provide the executive secretary of the commission with a copy of the signed document.

HOUSE BILL NO. 1782

PASSED: April 24, 2018

BETH HARWELL, SPEAKER
HOUSE OF REPRESENTATIVES

RANDY MCNALLY
SPEAKER OF THE SENATE

APPROVED this 15th day of May 2018

BILL HASLAM, GOVERNOR

Appendix B

Request for Removal and Redline of

Tennessee Air Pollution Control Regulation 1200-03-29

and Davidson County Regulation No. 8

from the Tennessee SIP

Department of Environment & Conservation

MEMORANDUM

DATE: **July 18, 2019**

SUBJECT: Request for Removal of *Chapter 1200-3-29 – Light- Duty Motor Vehicle Inspection and Maintenance* from the State of Tennessee State Implementation Plan

This document is Appendix B of the report entitled *Clean Air Act Section 110(l) Noninterference Demonstration for the Removal of the Inspection and Maintenance program in the Middle Tennessee Area*. The 110(l) presents the technical support for elimination of the vehicle inspection program. This Appendix is the request for removal of the attached *Chapter 1200-3-29 (Light Duty Motor Vehicle Inspection and Maintenance)* from the Tennessee State Implementation Plan based on the findings of the 110(l) demonstration.

The attached redline/strikeout of Chapter 1200-3-29 was downloaded from the Federal Environmental Protection Agency web-site https://www.epa.gov/sips-tn/epa-approved-statutes-and-regulations-tennessee-sip on July 10, 2019. To the best of our knowledge this document accurately presents Chapter 1200-3-29 of the applicable State Implementation Plan for the State of Tennessee under section 110 of the Clean Air Act, 42 U.S.C. 7401, and 40 CFR part 51.

The Tennessee Department of Environment & Conservation Division of Air Pollution Control requests that Chapter 1200-3-29 be removed in its entirety from the Tennessee State Implementation Plan.

Chapter 1200-3-29
Light-Duty Motor Vehicle Inspection and Maintenance

1200-3-29-.01 Purpose

The purpose of this Chapter is to reduce the air pollution produced by the operation of light-duty motor vehicles.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; effective April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.

	Date Submitted to EPA	Date Approved by EPA	Federal Register
Original Reg	JUL 8, 1994	JUL 28, 1995	60 FR 38694

1200-3-29-.02 Definitions

As used in this Chapter, all terms not defined herein shall have the meaning given them in Chapter 1200-3-2:

(1) Air Pollution is any particulate matter or any gas or vapor other than water or any combination thereof including any physical, chemical, biological, radioactive substance or matter which is emitted into or otherwise enters the ambient air.

(2) Antique motor vehicle is any motor vehicle over twenty-five years old which is owned solely as a collectors' item and is used for participation in club activities, exhibits, tours, parades and similar uses, but in no event for general transportation.

(3) Carbon dioxide is a compound consisting of the chemical formula (CO_2).

(4) Carbon monoxide is a compound consisting of the chemical formula (CO).

(5) Catalytic converter is a pollution control device containing a catalyst for converting automobile exhaust into mostly harmless products.

(6) Centralized Network means that motor vehicle inspections are conducted by the State and/or a single contractor in an area.

(7) Certificate of Compliance is a certification issued by a Department vehicle inspector or a fleet vehicle inspector that the motor vehicle identified on the certificate complies with the emission performance and anti-tampering criteria appropriate to the vehicle as specified in this regulation.

(8) Check Engine Light: for the definition see Malfunction Indicator Light (MIL).

(9) Contractor is a person (as defined in 1200-3-2) with whom the Department has a contract that provides for the operation of one or more Official Inspection Stations.

(10) Department means the Tennessee Department of Environment and Conservation, Division of Air Pollution Control.

(11) Department Vehicle Inspector is any person employed by the Tennessee Division of Air Pollution Control and/or contractor who is designated by the Technical Secretary as qualified to perform vehicle emissions performance and anti-tampering inspections.

(12) Diagnostic Trouble Codes (DTCs) is an alphanumeric code which is set in a

vehicle's onboard computer when a monitor detects a condition likely to lead to (or has already produced) a component or system failure or otherwise contribute to exceeding emissions standards by 1.5 times the certification FTP standard.

(13) Diesel powered motor vehicle is a motor vehicle powered by a compression-ignition internal combustion engine.

(14) Electric powered motor vehicle is a motor vehicle which uses a propulsive unit powered exclusively by electricity.

(15) Exhaust emissions are substances emitted into the atmosphere from any opening downstream from the exhaust ports of a motor vehicle engine.

(16) Exhaust gas analyzer is a device for sensing the amount of air pollutants, including carbon monoxide and hydrocarbons, in the exhaust emissions of a motor vehicle. For the purpose of this regulation, this shall mean analyzing devices of the nondispersive infrared type or any other analyzing devices that provide equal or greater accuracy as approved by the Technical Secretary.

(17) Factory-Installed Motor Vehicle Pollutant Control System is a motor vehicle pollution control system installed by the vehicle or engine manufacturer to comply with the United States government motor vehicles emission control laws and regulations.

(18) Federal Test Procedure (FTP) is the test procedure used to determine the compliance of vehicles with federal emission standards.

(19) Fleet means 50 or more light-duty motor vehicles owned by the same person or business entity which are in use, registered in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program in order to attain and maintain compliance with national ambient air quality standards within any area of Tennessee or an adjoining state and not owned or held primarily for the purpose of resale.

(20) Fleet Inspection Location is any motor vehicle inspection facility operated by a fleet operator holding a valid fleet inspection permit.

(21) Fleet Inspection Permit is a certificate issued by the Technical Secretary authorizing a fleet operator to conduct motor vehicle inspections in accordance with this regulation and other requirements as determined by the Department.

(22) Fleet Operator is the person owning a group of motor vehicles which constitute a fleet as defined in this regulation.

(23) Fleet Vehicle Inspector is any person retained by a fleet operator holding a valid fleet inspection permit and who is certified by the Technical Secretary as qualified to perform vehicle emissions performance and anti-tampering inspections.

(24) Fuel inlet restrictor is the leaded fuel nozzle restrictor installed on motor vehicles which was designed for the use of unleaded gasoline only.

(25) Gasoline powered motor vehicle is any motor vehicle powered by spark-ignition internal combustion engine.

(26) Gross Vehicle Weight Rating (GVWR) is a term defining the gross vehicle weight as determined from the combined manufacturer vehicle and maximum load rating.

(27) Heavy-duty motor vehicle is any motor vehicle having a combined manufacturer vehicle and maximum load rating (GVWR) to be carried thereon in excess of 10,500 pounds (4,773 kilograms).

(28) Hydrocarbon is any organic compound consisting predominantly of carbon andhydrogen.

(29) Idle speed means the unloaded engine speed of a motor vehicle when the accelerator pedal is fully released. In a vehicle equipped with an automatic transmission, this is with the drive selector in neutral or park. In a vehicle equipped with a manual transmission, this is with the gear selector in neutral and the clutch fully engaged. In all vehicles, the engine operated accessories shall be turned off.

(30) Internal combustion engine is any engine in which the combustion of gaseous, liquid or pulverized solid fuel takes place within one or more cylinders, or any engine with one or more combustion chambers.

(31) Light-duty motor vehicle is any motor vehicle having a combined manufacturer vehicle and maximum load rating (GVWR) to be carried thereon of 10,500 pounds (4,773 kilograms) or less.

(32) Malfunction Indicator Light (MIL) is known as the Check Engine light. The Malfunction Indicator Light is illuminated on the dashboard when conditions exist likely to result in emissions exceeding FTP standards by 1.5 time or

worse. Alternatives include "Service Engine Soon," as well as an unlabeled icon of an engine.

(33) Manufacturers Idle speed Specification is the engine idle speed specified for a particular motor vehicle as printed on the engine compartment emissions system data plate or in the owners manual.

(34) Model Year means the annual production period of new motor vehicles or new motor vehicle engines designated by the calendar year in which such production ends. If the manufacturer does not designate a production period, the year with respect to such vehicle or engines shall mean the twelve (12) month period beginning January of the year in which production thereof begins. The model year for a motor vehicle constructed by other than the original manufacturer shall be assigned by the Technical Secretary.

(35) Motor vehicle is any self-propelled vehicle used for transporting persons or commodities on public roads.

(36) Motor Vehicle Regulatory License is the annual motor vehicle license required as a condition for legal operation of certain classes of motor vehicles.

(37) Motorcycle is any motor vehicle having a seat or saddle for the use of the rider and designed totravel on not more than three wheels in contact with the ground, and having a curb weight of 2000 pounds (907 kilograms) or less.

(38) New motor vehicle is any motor vehicle that has never been previously titled or registered in this or any other jurisdiction and whose ownership document remains as a manufacturer's certificate of origin.

(39) Official Inspection Station means a facility operated by the Department and/or contractor to conduct test only vehicle inspections pursuant to this regulation, in a CentralizedNetwork.

(40) Onboard Diagnostics (OBD) is a system of vehicle component and condition monitors controlled by a central, onboard computer designed to signal the motorist when conditions exist which could lead to a vehicle's exceeding its certification standards by 1.5 times the FTP standard.

(41) OBD Data Link Connector (DLC) serves as an interface between a vehicle's OBD computer and the OBD scanner and is usually located under the dashboard on the driver's side. Connecting an OBD scanner to the DLC allows inspectors and vehicle repair technicians to read the readiness status of vehicle's onboard monitors as well as any diagnostic trouble codes.

(42) Pollution Control Device is the equipment designed by the manufacturer for installation on a motor vehicle for the purpose of reducing pollutants emitted from the vehicle, or a system or engine modification on a motor vehicle which causes a reduction of pollutants emitted from the motor vehicle.

(43) Readiness codes are status flags stored by a vehicle's onboard computer which is different from the DTC in that it does not indicate a vehicle fault, but rather whether or not a given monitor has been run (i.e. whether or not the component or system in question has been checked to determine if it is functioning properly).

(44) RPM is a term describing the engine crankshaft revolutions per minute.

(45) Tampering means to remove, render inoperative, cause to be removed, or make less operative any emission control device, unless such removal or act to render inoperative or less operative is for the purpose of motor vehicle disposal or salvage operation.

(46) Technical Secretary is the Technical Secretary of the Air Pollution Control Board of the State of Tennessee or his designated representative.

(47) Vehicle Exhaust System means all devices, equipment and systems which transport exhaust emissions from the exhaust ports of the motor vehicle engine to the atmosphere.

(48) Wheel Tax is the annual commercial vehicle tax required as a condition for the legal operation of certain classes of motor vehicles.

(49) Opacity is the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994. Amendment filed July 8, 2001; effective October 1, 2001. Amendment filed September 19, 2001; effective December 3, 2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.03 Motor Vehicle Inspection Requirements

(1) All of the light-duty motor vehicles registered in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program or directly with the motor vehicle division of the Tennessee Department of Revenue pursuant to T.C.A. § 55-4-207 and used within or assigned to a user within that county, except those exempted by Rule 1200-3-29-.04, are required to be inspected annually for compliance with emissions performance and anti-tampering test criteria in Rules 1200-3-29-.05 and 1200-3-29-.06. Owners of vehicles so inspected are required to obtain a Certificate of Compliance. A Certificate of Compliance shall be valid for 90 days following the date of issuance, except for those registered pursuant to T.C.A. § 55-4-207, which shall be valid for one year.

(2) Any light-duty vehicle which is owned or operated by an agency of the federal government and which is operated on a federal installation located in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program is required to be inspected annually for compliance with emissions performance and anti-tampering criteria in Rules 1200-3-29-.05 and 1200-3-29-.06. This requirement shall not apply to a vehicle which is on the facility for less than a total of 60 days during the calendar year.

(3) A Certificate of Compliance shall be issued only by the Department and/or contractor vehicle inspector or a licensed fleet vehicle inspector and only after the vehicle demonstrates compliance with the test criteria established in Rules 1200-3-29-.05 and 1200-3-29-.06.

(4) All light-duty motor vehicles required to obtain a Certificate of Compliance except those vehicles contained in a fleet which has a valid fleet inspection permit and those vehicles registered in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program but not subject to either the Wheel Tax or the Motor Vehicle Regulatory License requirements shall obtain a valid Certificate of Compliance within 90 days prior to the required date for payment of the wheel tax or the motor vehicle regulatory license fee as appropriate to the class of motor vehicle.

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(5) All light-duty motor vehicles required to obtain a Certificate of Compliance that are contained in a fleet having a valid fleet inspection permit, operated on a Federal installation registered in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program or vehicles registered in any county that has been designated by the Board to have a motor vehicle inspection and maintenance program in order to attain and maintain compliance with national ambient air quality standards

within any area of Tennessee or an adjoining state but exempt from the Wheel Tax and Motor Vehicle Regulatory License requirements shall obtain a valid Certificate of Compliance within 90 days prior to a compliance date for that particular motor vehicle. The Technical Secretary shall establish a schedule of compliance dates for such vehicles. A copy of the Certificate of Compliance for each fleet vehicle shall be submitted to the Technical Secretary within 90 days of the compliance date. A list of all subject vehicles shall be submitted to the Technical Secretary or his designee on an annual basis as directed by the division. Additionally, notification of any changes to the list of subject vehicles shall be made to the division within 30 days of such changes.

(6)(5) The Certificate of Compliance must be presented to the County Clerks' office prior to the issuance of the Wheel Tax or the Vehicle Regulatory License.

(7)(6) The requirements contained in this Chapter shall become effective July 1, 1994. The provisions concerning OBD testing shall become effective July 1, 2002.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994. Amendment filed October 12, 1998; effective December 26, 1998. Amendment filed July 8, 2001; effective October 1, 2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.04 Exemption from Motor Vehicle Inspection Requirements

(1) The following classes of motor vehicles are exempt from the requirements established in Rule 1200-3-29-.03 of this Chapter:

(a) antique motor vehicles

(b) electric powered light-duty vehicles

(c) light-duty motor vehicles with a designated model year prior to 1975

(d) motorcycles

(e) heavy-duty motor vehicles

(f) new motor vehicles being registered for the first time or one year from initial registration

(g) tactical military vehicles

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.
Amendment filed September 19, 2001; effective December 3, 2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.05 Motor Vehicle Emission

Performance Test Criteria

(1) Vehicles shall not be allowed to complete emission performance testing if one or more of the following conditions exist when the vehicle is presented for testing:

(a) For 1975 through 1995 model gasoline powered motor vehicles, if the vehicle exhaust system leaks in such a way as to dilute the exhaust emissions being sampled by the exhaust gas analyzer, the sum of carbon monoxide and carbon dioxide concentrations recorded for idle speed reading from an exhaust outlet must not be less than 6%.

(b) For 1975 through 2001 model diesel powered motor vehicles, if the vehicle's exhaust system leaks in such a way as to dilute the exhaust emissions being sampled.

(c) The visible emissions from the motor vehicle are such that it would interfere with operation of the testing equipment.

(2) Gasoline powered motor vehicle models 1975 through 1995 which have idle speed emission values that exceed the test standards specified in Table I shall fail the emission performance test.

TABLE I
MAXIMUM IDLE SPEED EMISSIONS ALLOWABLE
DURING IDLE SPEED EMISSIONS TEST

Vehicle Model Year	CO (%)		HC (PPM)	
	Light-Duty Vehicles Less Than or Equal To 6000 lbs GVWR	Light-Duty Vehicles Greater Than 6000 lbs GVWR	Light-Duty Vehicles Less Than or Equal 6000 LBS GVWR To 6000 lbs GVWR	Light-Duty Vehicles
1975	5.0	6.5	500	750
1976	5.0	6.5	500	750
1977	5.0	6.5	500	750
1978	4.0	6.0	400	600
1979	4.0	6.0	400	600

1980	3.0	4.5	300	400
1981 – 1995	1.2	4.0	220	400

(3) Light-duty diesel powered motor vehicle models 1975 through 2001 shall be subject to the curb idle test as follows:

(a) A diesel vehicle shall not emit visible emissions in excess of ten (10) percent opacity for ten (10) or more consecutive seconds, as measured at idle engine speed.

(4) All 1996 and newer gasoline powered motor vehicles and all 2002 and newer diesel powered motor vehicles shall be subject to an OBD inspection. An OBD check shall consist of two parts : a visual check of the MIL and an electronic examination of the OBD computer. The vehicle is required to pass a MIL command on test and a bulb check test. After the vehicle has passed the MIL command on test and the bulb check test, it must not have any DTCs set and all of the required readiness codes must be set in order to pass an OBD inspection.

(5) When a motor vehicle is equipped with other than the original engine or when a motor vehicle has been constructed, modified, customized or altered in such a way so that the model year cannot be clearly determined, the vehicle shall be classified for purposes of the emission performance test bythe model year of the chassis.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq.
Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.
Amendment filed September 19, 2001; effective December 3,2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.06 Motor Vehicle Anti-Tampering Criteria

(1) Each gasoline powered motor vehicle subject to an emission performance test is also subject to a visual anti-tampering inspection under this rule and shall comply with the following minimum anti-tampering requirements:

(a) At a minimum, the emissions control devices subject to an inspection are the catalytic converter, and fuel filler cap. If emission control devices are found in a tampered condition, such devices shall be repaired or replaced prior to any retesting or reinspection as provided for in Rule 1200-3-29-.10.

(b) Nothing in this Rule shall be construed as to relieve a motor vehicle owner from complying with the provisions of Rule 1200-3-29-.05.

(2) Each gasoline powered motor vehicle subject to an OBD inspection is also subject to an anti- tampering test, and shall comply with a DLC check, and a fuel cap pressure test.

(3) Each diesel powered motor vehicle subject to an emission performance test is also subject to an anti-tampering test and shall comply at a minimum with a catalytic converter check, if applicable, and a fuel capcheck.

(4) Each diesel powered motor vehicle subject to an OBD inspection is also subject to an anti- tampering test, and shall comply with a DLC check and a fuel capcheck.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative istory: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.
Amendment filed September 19, 2001; effective December 3, 2001.

	Date Submitted to EPA	Date Approved by EPA	Federal Register
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.07 Motor Vehicle Emissions Performance Test Methods

(1) For gasoline powered motor vehicles, the motor vehicle emissions performance test shall consist of the sampling of exhaust emissions at idle speed and measurement of CO_2 dilution, CO concentration and HC concentration.

(2) For gasoline powered motor vehicles, sampling of exhaust emissions shall consist of measurement of CO_2 dilution, CO concentration and HC concentration during idle operation using an approved exhaust gas analyzer. Measurements taken during the initial idle phase may be succeeded by measurements taken during a second idle phase which has followed an engine conditioning phase consisting of engine operation at approximately 2500 RPM for approximately 20 seconds. The lowest emission readings from either of these idle speed test phases shall be used to determine pass or failure of the emissions performance test.

(3) For diesel powered motor vehicles, the motor vehicle emissions performance test shall consist of the Curb Idle test procedures for diesel vehicles:

(a) Diesel powered vehicles shall be inspected with an opacity meter that is a full flow, direct reading, continuous reading light extinction type using a collimated light source and photo-electric cell, accurate to within plus or minus five (5) percent.

(b) Separate measurements shall be made on each exhaust outlet on diesel vehicles equipped with multiple exhaust outlets. The reading taken from the outlet giving the highest reading shall be used for comparison with the standard for the vehicle being tested.

(4) For gasoline powered motor vehicles with a model year of 1996 and newer and for diesel powered motor vehicles with a model year of 2002 and newer, an onboard diagnostic test shall be performed. All vehicles that have a readily accessible OBD system shall be tested. The results of the test shall be used to determine pass or failure of the vehicle.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994. Amendment filed September 19, 2001; effective December 3, 2001.

	Date Submitted to EPA	Date Approved by EPA	Federal Register
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.08 Motor Vehicle Anti-Tampering Test Methods

(1) For vehicles 1975 to 1995, the motor vehicle anti-tampering test shall be verified by the Department vehicle inspector and consist of the following elements:

(a) The vehicle shall be checked by the vehicle inspector to see that the appropriate fuel cap is securely in place. If the appropriate fuel cap is not in place, it shall result in the failure of the anti-tampering test.

(b) The vehicle shall be checked visually (with a mirror or otherwise) to see if the catalytic converter is the correct type for the certified vehicle configuration and is properly connected. If the catalytic converter has been tampered with, removed or is the incorrect configuration, it shall result in the failure of the anti-tampering test.

(2) Each gasoline powered motor vehicle with a model year of 1996 and newer is subject to an anti- tampering test, and shall comply with the DLC and a fuel cap pressure test. The anti-tampering test shall consist of the following elements:

(a) Vehicle shall be visually checked to see if the appropriate fuel cap is securely in place.

(b) If the fuel cap is present, it shall be removed and a fuel cap pressure test shall be performed to assure the cap is working properly. (F.T.P. 26-21 Pass/Fail Standard). If the fuel cap fails the pressure test, it shall result in a failure of the anti-tampering test.

(c) If the DLC has been tampered with or is missing, it must be repaired or replaced prior to any retesting or reinspection. If the vehicle is incompatible with the OBD test equipment or if the DLC is readily unavailable, then the vehicle is required to pass the idle speed emission values as specified in Paragraph 1200-3-29-.05.

(3) Each diesel powered motor vehicle with a model year of 2002 and newer is subject to an anti- tampering test, and shall comply at a minimum with a DLC check and a fuel cap pressure test. The anti-tampering test shall consist of the following elements:

(a) Vehicle shall be visually checked to see if the appropriate fuel cap is securely in place.

(b) If the DLC has been tampered with or is missing, it must be repaired or replaced prior to any retesting or reinspection. If the vehicle is incompatible with the OBD test equipment or if the DLC is readily unavailable, then the vehicle is subject to the Curb Idle test as specified in Paragraph 1200-3-29-.05.

(4) Pass/fail determination. A pass or fail determination shall be made for each of the test elements in Paragraph 1200-3-29-.08(1), (2), or (3). If a vehicle fails any of the anti-tampering elements in Paragraph 1200-3-29-.08(1), (2), or (3), it shall result in the failure of the motor vehicle inspection test and a Certificate of Compliance shall not be issued until the repairs have been made to the vehicle.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.
Amendment filed September 19, 2001; effective December 3, 2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.09 Motor Vehicle Inspection Program

(1) The motor vehicle inspection program shall be operated by the Tennessee Department of Environment and Conservation, Division of Air Pollution Control, the State approved local government and/or the State approved contractor.

(2) All motor vehicle inspections shall be conducted at official or mobile inspection stations operated by the Department, local government and/or contractor except those fleet inspections provided for in Paragraph 1200-3-29-.09(3) of this regulation.

(3) In lieu of the requirement in Paragraph 1200-3-29-.09(2) of this regulation, vehicles owned or operated by a fleet operator to whom a fleet inspection permit has been issued may be inspected by a licensed fleet vehicle inspector at a site other than an official inspection station.

(4) A light-duty fleet vehicle operator may make application to the Technical Secretary for a fleet inspection permit. Minimum requirements for issuance of a permit shall be:

(a) Possession of an approved analyzer, tools and testing equipment determined by the Technical Secretary to be adequate for conducting the required emissions inspections;

(b) Demonstration of knowledge of methods and procedures for conducting the required emissions performance and anti-tampering inspections according to criteria developed by the Technical Secretary;

(c) Provisions of appropriate facility for vehicle testing and appropriate secure storage facility for storage of Certificates of Compliance and records of inspections;

(d) Agreement to supply inspection and Certificate of Compliance issuance information as requested by the Technical Secretary and to allow access to testing facility, testing equipment, testing personnel, testing data, Certificate of Compliance inventory and fleet vehicles as requested by the Technical Secretary;

(e) Retention of licensed fleet vehicle inspector to conduct fleet vehicle inspections.

(5) A fleet inspection permit shall be valid for one year from the date of issuance

and may be renewed through application to the Technical Secretary within 30 days prior to the date of expiration. A fleet inspection permit is not transferable and may be denied, suspended or revoked by the Technical Secretary for failure to comply with this regulation and other requirements as determined by the Department.

(6) A person employed or retained by a fleet operator holding a valid fleet inspection permit may make application to the Technical Secretary for a fleet vehicle inspector's license. Minimum requirements for issuance of this license shall be:

(a) Successful completion of a vehicle inspector training course prepared and offered by the Department;

(b) Successful completion of the mechanics training course approved by the Technical Secretary;

(c) Agreement to participate in additional training activities from time to time as specified by the Technical Secretary;

(d) Provision of written evidence that applicant is employed or retained by the fleetoperator.

(7) A fleet inspector's license shall be valid for one year from the date of issuance and may be renewed through application to the Technical Secretary within thirty (30) days prior to the date of expiration. A fleet vehicle inspector's license is not transferable and may be denied, suspended or revoked by the Technical Secretary for failure to comply with this regulation and other requirements as determined by the Department.

(8) All vehicles issued a Certificate of Compliance under the provision of Paragraph 1200-3-29-.09(3) of this regulation shall be subject to retesting at either the fleet inspection location or an officialinspection station as deemed necessary by the Technical Secretary in order to maintain compliance with the intent of this regulation.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.10 Motor Vehicle Inspection Fee

(1) There shall be a fee set by the Tennessee Air Pollution Control Board for the Inspection & Maintenance program. The fee shall be for each emission test and payable at the time of inspection by the operator of the vehicle subject to the testing.

(2) There shall be a fee of five dollars ($5.00) for each Certificate of Compliance generated by licensed fleet inspectors for issuance to motor vehicles which comply with the testing provisions of this regulation.

(3) Each vehicle which fails its initial inspection is entitled to one (1) reinspection at no charge if the vehicle is accompanied by the entire initial inspection report.

(4) Motor vehicle owners or operator shall be given in writing the results of all inspection procedures carried out at any official inspection station.

(5) There shall be a fee of One Hundred Dollars ($100.00) for each annual Fleet Inspection Permit issued to fleet vehicle operators.

(6) There shall be a fee of One Hundred Dollars ($100.00) for each initial annual Fleet Vehicle Inspector's License issued to a fleet vehicle inspector; there shall be a fee of Twenty-Five Dollars ($25.00) for each annual renewal of a Fleet Vehicle Inspector's License.

Authority: T.C.A. §§ 68-201-105 and 4-5-201 et. seq. Administrative History: Original rule filed February 14, 1994; April 30, 1994. Stay of effective date filed April 15, 1994; effective June 14, 1994.
Amendment filed July 8, 2001; effective October 1, 2001; Amendment filed September 19, 2001;
effective December 3, 2001.

	Date Submitted to EPA	**Date Approved by EPA**	**Federal Register**
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

1200-3-29-.12 Area of Applicability

(1) Chapter 1200-3-29 shall apply in the following areas of Tennessee as designated by the Tennessee Air Pollution Control Board:

(a) Davidson County

(b. Hamilton County

(c) Rutherford County

(d) Sumner County

(e) Williamson County

(f) Wilson County

(2) For the counties specified in paragraph 1200-3-29-.12(1), the requirements contained in this Chapter shall become effective as follows:

(a) For EPA designated nonattainment counties classified as Basic, the effective date is April 1, 2006.

(b) For EPA designated nonattainment counties with an EPA approved Early Action Compact classified as Basic, the effective date is April 1, 2005.

(c) For EPA designated nonattainment areas classified as Marginal, the effective date isJuly 1, 2005.

(d) For EPA designated nonattainment areas classified as Moderate, the effective date is April 1, 2007.

(e) For counties that would like to volunteer to implement a vehicle inspection andmaintenance program, the startup date will be determined by the County and the Tennessee Air Pollution Control Board.

Authority: T. C.A. Section §§ 68-201-105, 55-4-130 and 4-5-201 et. seq.

Administrative History: Original rule filed_____2004 ; effective date_____ 2004.

	Date Submitted to EPA	Date Approved by EPA	Federal Register
Original Reg	DEC 29, 2004	AUG 26, 2005	70 FR 50199

Metro Public Health Dept
Nashville / Davidson County
Protecting, Improving, and **Sustaining** Health

July 29, 2019

Michelle W. Owenby, Director
Air Pollution Control Division
Department of Environment and Conservation
Tennessee Tower, 15th Floor
312 Rosa L. Parks Ave.
Nashville, TN 37243

Dear Ms. Owenby:

As you know, Tennessee Public Chapter 953 requires the discontinuation of vehicle inspection and maintenance programs once their requirement has been removed from the State Implementation Plan (SIP). Davidson County has taken advantage of the exemption provided in the rule and will be maintaining a local inspection program, at least through the life of the existing contract. However, there is no need for this ongoing program to be federally mandated through the SIP. Therefore, I am requesting that Regulation No. 8, "Inspection and Maintenance of Light-Duty Motor Vehicles" be removed from Davidson County's portion of the SIP. Enclosed, please find an underline/strikeout version of the regulation to reflect the proposed changes to the SIP.

If there are any questions concerning this matter, please feel free to contact me at (615) 340-5653.

Sincerely,

John Finke, P.E.
Director
Metro Public Health Department
Pollution Control Division

METROPOLITAN PUBLIC HEALTH DEPARTMENT
DIVISION OF POLLUTION CONTROL

REGULATION NO. 8

Inspection and Maintenance of Light-Duty Motor Vehicles

As provided for in the Code of Laws of the Metropolitan Government of Nashville and Davidson County, Tennessee, Chapter 10.56, "Air Pollution Control", Section 10.56.090 and Section 10.56.240.

Adopted May 13, 1981
As Amended February 15, 1984
As Amended November 9, 1993
As Amended July 10, 2001
As Amended July 31, 2001
As Amended December 14, 2004
As Amended June 8, 2007
By the Metropolitan Board of Health
of Nashville and Davidson County, Tennessee

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RESOLUTION NO. RS2007-2013

A resolution approving an amendment to Regulation No. 8 of the Metropolitan Board of Health to reduce the fee charged for emissions inspections of light-duty motor vehicles and approving a contract amendment between the Metropolitan Government and SysTech International, LLC, for the provision of services relating to automobile emission testing.

WHEREAS, Section 10.56.240 of the Metropolitan Code authorizes the Metropolitan Board of Health to adopt and promulgate regulations for a program of inspection and maintenance (I&M) of internal combustion engines and requires that any such regulation be approved by resolution of the Metropolitan Council; and,

WHEREAS, the Board of Health adopted and promulgated its Regulation No. 8 that established the I&M program; and,

WHEREAS, Regulation No. 8 and subsequent amendments thereto have been approved by resolutions of the Metropolitan Council; and,

WHEREAS, Section 8-9 (a) of Regulation No. 8 currently sets the fee charged for emissions inspections of light-duty motor vehicles at $10.00 per inspection; and,

WHEREAS, at the request of the Metropolitan Council, the Board of Health has reviewed the fee charged for inspections and has determined that Regulation No. 8 should be amended to reflect a reduced fee of $9.00 per inspection; and,

WHEREAS, the Metropolitan Government previously entered into a contract with SysTech International, LLC, for the provision of services relating to automobile emission testing; and

WHEREAS, both parties wish enter into an Amendment to the contract, as evidenced by the signatures on the contract attached hereto as Exhibit 1 and incorporated herein; and

WHEREAS, it is in the best interest of the citizens of The Metropolitan Government of Nashville and Davidson County that this amendment to Regulation No. 8 and to the contract Amendment with SysTech International, LLC, be approved.

NOW, THEREFORE, BE IT ENACTED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

SECTION 1. That Section 8-9 (a) of Regulation No. 8 of the Metropolitan Board of Health, attached hereto an incorporated herein, be amended to reduce the fee for emissions inspections from $10.00 per inspection to $9.00 per inspection.

SECTION 2. That the contract Amendment by and between the Metropolitan Government and SysTech International, LLC, attached as Exhibit 1 to this resolution is hereby approved and the Mayor, or his designee, is authorized to execute it on behalf of the Metropolitan Government.

SECTION 3. This resolution shall take effect from and after its adoption, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.

Sponsored by: Ryman, Brenda Gilmore, Billy Walls

Attachment(s) on file in the Metropolitan Clerk's Office

RESOLUTION NO. RS2005-694

A resolution approving amendments to Regulation No. 8 of the Metropolitan Board of Health regarding inspection and maintenance of light-duty motor vehicles.

Whereas, Tennessee Code Annotated 68-201-115 provides that local pollution control programs must have air pollution control regulations that are at least as stringent as those regulations promulgated by the Tennessee Air Pollution Control Board; and

Whereas, the Metropolitan Health Department was designated as the local promulgator and enforcer of air pollution control regulations for Davidson County by the federal Environmental Protection Agency ("EPA") in accordance with the Clean Air Act of 1968; and

Whereas, pursuant to that designation, the Metropolitan Health Department acting by and through the Metropolitan Board of Health was bound to promulgate regulations as stringent as those promulgated by the EPA; and

Whereas, the Tennessee Department of Environment and Conservation was designated by the EPA and the Clean Air Act as the state-wide enforcer and promulgator of air pollution control regulations, with the exception of those areas designated as local enforcement areas, such as Davidson County, as long as those local enforcement areas promulgated regulations as stringent as those promulgated by the state and by the EPA; and

Whereas, the EPA will defer the designation of localities as "non-attainment areas" provided eligible localities enter into an Early Attainment Compact "EAC"; and

Whereas, EAC's will allow designated localities to avoid the sanctions and controls that could imposed upon areas designated as "non-attainment areas" provided the conditions of the EAC are met; and

Whereas, the Tennessee Air Pollution Control Board promulgates and enforces air pollution control regulations for the State of Tennessee, and has entered into the Tennessee Early Action Compact ("EAC") for clean air; and

Whereas, a condition of the EAC adopted by the Tennessee Air Pollution Control Board is an 8-hour ozone standard that lowers the amount of allowable ozone in the air; and

Whereas, the Tennessee Air Pollution Control Board has chosen to make more types of vehicles subject to the vehicle inspection program to satisfy the requirements of the new standard; and

Whereas, the Tennessee Air Pollution Control Board recently amended Regulation 1200-3-29 to require that diesel light duty vehicles and light duty vehicles weighing not more than 10,500 pounds be subject to emissions testing; and

Whereas, Davidson, Hamilton, Rutherford, Sumner, Williamson, and Wilson counties were specifically included in the area of applicability for Regulation 1200-3-29; and

Whereas, Regulation 1200-3-29 became effective for Hamilton, Rutherford, Sumner, Williamson and Wilson counties on December 14, 2004; and

Whereas, Section 10.56.240 of the Metropolitan Code authorizes the Metropolitan Board of Health to adopt and promulgate regulations for a program of inspection and maintenance (I&M) of internal combustion engines and requires that any such regulation be approved by resolution of the Metropolitan Council; and,

Whereas, the Board of Health adopted and promulgated its Regulation No. 8 that established the I&M program; and,

Whereas, Regulation No. 8 and subsequent amendments thereto have been approved by resolutions of the Metropolitan Council; and,

Whereas, in order to comply with the new state regulation, the Board of Health, on December 14, 2004, adopted amendments to Regulation No. 8 that redefined "Heavy-duty Motor Vehicle" to mean motor vehicles with a GVWR in excess of 10,500 pounds; and "Light-duty Motor Vehicle" to mean motor vehicles with an GVWR of not more than 10,500 pounds; and, further adopted amendments that removed the exemption of diesel powered light-duty motor vehicles, thereby making such vehicles subject to the provisions of Regulation No. 8; and,

~~Whereas, it is in the best interest of The Metropolitan Government of Nashville and Davidson County for the Metropolitan Council to approve the amendments to Regulation No. 8.~~

~~Now, therefore, be it resolved by the Council of The Metropolitan Government of Nashville and Davidson County:~~

~~Section 1. That the amendments to Regulation No. 8 of the Metropolitan Board of Health, amending Sections 8-1, 8-2, 8-3, 8-4, 8-5, 8-6, and 8-7 thereof, to redefine "Heavy-duty Motor Vehicle" to mean motor vehicles with a GVWR in excess of 10,500 pounds; and "Light-duty Motor Vehicle" to mean motor vehicles with an GVWR of not more than 10,500 pounds; and, to remove the exemption of diesel-powered light-duty motor vehicles, thereby making such vehicles subject to the provisions of Regulation No. 8 , a copy of which amended Regulation No. 8 is attached hereto and made a part of this Resolution, be and the same are hereby approved.~~

~~Section 2. That this Resolution shall take effect from and after its adoption, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.~~

~~Sponsored by: Erik Cole~~

RESOLUTION NO. RS2001-716

A RESOLUTION APPROVING AMENDMENTS TO REGULATION NO. 8 OF THE METROPOLITAN BOARD OF HEALTH REGARDING INSPECTION AND MAINTENANCE OF LIGHT-DUTY MOTOR VEHICLES.

WHEREAS, Section 10.56.240 of the Metropolitan Code authorizes the Metropolitan Board of Health to adopt and promulgate regulations for a program of inspection and maintenance (I & M) of internal combustion engines and requires that any such regulation be approved by regulation of the Metropolitan Council; and,

WHEREAS, the Board of health adopted and promulgated its Regulation No. 8 that established the I&M program, including inspection fees; and,

WHEREAS, the inspection fees of Six Dollars ($6.00) for individually-owned light-duty vehicles and Three Dollars ($3.00) per vehicle for fleet-owned light-duty vehicles have remained unchanged since the inception of the I&M program in January 1985; and,

WHEREAS, on July 10,2001 and July 31, 2001, the Board of Health adopted two amendments to Regulation No.8, the first of which added a new testing procedure required by federal law called the Onboard Diagnostics Test (OBD), and the second which increased the inspection fees to Ten Dollars ($10.00) for individually-owned light-duty vehicles and Five Dollars ($5.00) for fleet-owned light-duty vehicles; and,

WHEREAS, the State of Tennessee has already adopted OBD requirements and identical inspection fee increases to be applied in Sumner, Wilson, Rutherford, and Williamson Counties where the State operates I&M programs; and,

WHEREAS, it is in the best interest of The Metropolitan Government of Nashville and Davidson County for the Metropolitan Council to approve the amendments to Regulation No. 8.

Now, therefore, be it resolved by the Council of The Metropolitan Government of Nashville and Davidson County:

SECTION 1. That the amendments to Regulation No. 8 of the Metropolitan Board of Health, amending Sections 8-1, 8-4, 8-5, 8-6, 8-7, and 8-9 thereof, to add Onboard Diagnostic Testing and to increase the inspection fees to Ten Dollars ($10.00) for individually-owned light-duty vehicles and Five Dollars ($5.00) for fleet-owned vehicles, a copy of which amended Regulation No. 8 is attached hereto and made a part of this Resolution, be and the same are hereby approved.

SECTION 2. That this Resolution shall take effect from and after its adoption, the welfare of The Metropolitan Government of Nashville and Davidson County requiring it.

Sponsored By: Saletta Holloway & Howard Gentry AMENDMENT NO. 1 TO RESOLUTION NO. RS2001-716

Mr. President:

I move to amend Resolution No. RS2001-716 by adding the following sentence at the end of Section 1 thereof:

The increase in the inspection fees to Ten Dollars ($10.00) and Five Dollars ($5.00) respectively as stated in Section 8-9 of regulation No. 8 shall take effect on October 2, 2001.

RESOLUTION NO. R94-1049

A RESOLUTION APPROVING AN AMENDMENT TO REGULATION NO. 8 OF THE METROPOLITAN BOARD OF HEALTH REGARDING INSPECTION AND MAINTENANCE OF LIGHT-DUTY MOTOR VEHICLES.

WHEREAS, Metropolitan Code, Section 10.56.240, authorizes the Metropolitan Board of Health to adopt, promulgate and enforce rules and regulations regarding an inspection and maintenance program for light-duty motor vehicles; and,

WHEREAS, in 1981 the Metropolitan Board of Health adopted its Regulation No. 8, implementing an inspection and maintenance program of light-duty motor vehicles; and,

WHEREAS, on November 9, 1993, the Metropolitan Board of Health adopted amendments to Regulation No. 8, adding a three-point anti-tampering check for pollution control equipment as mandated by regulations promulgated by the United States Environmental Protection Agency; and

WHEREAS, said amendment to Regulation No. 8 cannot take effect until it is approved by Resolution of the Metropolitan Council.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

SECTION 1. That the amendment to Regulation No. 8 of the Metropolitan Board of Health, which adds a new Section 8-7 requiring a three-point anti-tampering check of pollution control equipment to the light-duty motor vehicle testing program, a copy of which amended Regulation No. 8 is attached hereto and made a part of this Resolution, be and the same is hereby approved.

SECTION 2. That this Resolution shall take effect from and after its adoption, the welfare of the Metropolitan Government of Nashville and Davidson County requiring it.

APPROVED AS TO AVAILABILITY OF FUNDS;

Acting Director, Metropolitan Finance Department

APPROVED AS TO LEGALITY OF FORM AND COMPOSITION

Metropolitan Attorney

RESOLUTION NO. R84-163

A RESOLUTION EMENDING RESOLUTION NO. 83-1471 BY APPROVING CERTAIN AMENDMENTS ADOPTED BY THE METROPOLITAN BOARD OF HEALTH TO ITS REGULATION NO. 8 RELATIVE TO MANDATORY INSPECTION AND MANDATORY INSPECTION AND MAINTENANCE FOR LIGHT-DUTY MOTOR VEHICLES.

WHEREAS, the Metropolitan Council adopted Resolution No. 83-1471 on May 17, 1983, which approved those portions of Regulation No. 8 of the Metropolitan Health Department, Pollution Control Division, relative to mandatory inspection and maintenance of light-duty vehicles; and,

WHEREAS, the Metropolitan Board of Health has adopted certain amendments to Regulation No. 8 which allow for a portion of said inspection to be conducted by a private contractor.

BE IT RESOLVED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY, TENNESSEE.

SECTION 1. That Resolution No. 83-1471 be amended by approval of the amendments to Regulation No. 8, Metropolitan Health Department, Pollution Control Division, as adopted by the Metropolitan Board of Health on February 15, 1984, and that said amendments be, and the same are hereby approved.

SECTION 2. That this Resolution shall take effect from and after its adoption, the welfare of the Metropolitan Government of Nashville and Davidson County requiring it.

Approved By The
Metropolitan Council of Nashville and Davidson County
February 21, 1984

RESOLUTION NO. R83-1471

A RESOLUTION APPROVING REGULATIONS ADOPTED BY THE METROPOLITAN BOARD OF HEALTH PURSUANT TO SECTION 10.56.240 OF THE METROPOLITAN CODE AND PROVIDING FOR A MANDATORY INSPECTION AND MAINTENANCE PROGRAM FOR LIGHT DUTY MOTOR VEHICLES.

WHEREAS, Metropolitan Code Section 10.56.240(d) empowers the Metropolitan Board of Health to adopt regulations requiring regularly inspection and maintenance of light-duty motor vehicles; and

WHEREAS, Metropolitan Code Section 10.56.240(d) also states that any regulation be approved by resolution of the Metropolitan Council before it may take effect as law; and

WHEREAS, the Metropolitan Board of Health at its regular meeting on May 13, 1981, adopted regulations requiring mandatory yearly inspection and maintenance of light-duty motor vehicles, empowered by internal combustion engines, to promote automobile safety as well as air pollution control; and

WHEREAS, the Metropolitan Government is faced with the likely prospect of federally-imposed sanctions mandated by the Congress in the Clean Air Act of 1978, including the prohibitions and the loss of a substantial amount of federal funds, should this Government not initiate a program requiring inspection and maintenance for light-duty motor vehicles;

THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE METROPOLITAN GOVERNMENT OF NASHVILLE AND DAVIDSON COUNTY:

SECTION 1. That the regulations adopted by the Metropolitan Board of Health under authority of Section 10.56.240(d) of the Metropolitan Code, requiring inspection and maintenance of light-duty motor vehicles, which regulations are attached hereto and made a part of this Resolution are hereby approved, with the exception of Sections 8-5 and 8-7 thereof, by the Metropolitan Council pursuant to Metropolitan Code Section 10.56.240(d).

SECTION 2. This resolution and the regulations herein approved shall take effect as to fleet operations as defined in all other vehicles covered in said regulations on July 1, 1984, the welfare of the Metropolitan Government of Nashville and Davidson County requiring it.

Approved by the
Metropolitan Council of Nashville and Davidson County
May 17, 1983

Regulation of Emissions From Light-duty Motor Vehicles through Mandatory Vehicle Inspection and Maintenance Program

This Regulation is adopted for the purpose of preventing, abating and controlling air pollution caused by excessive air contaminants discharged into the air from the operation of light-duty motor vehicles. This Regulation is promulgated as provided for in Section 10.56.240, "Internal Combustion Engines", and Section 10.56.090, "Board Powers and Duties," Chapter 10.56, of the Metropolitan Code of Laws.

SECTION 8-1: Definitions

All terms not defined herein shall have the meaning given in Chapter 10.56, "Air Pollution Control," Section 10.56.010, "Definitions," of the Metropolitan Code of Laws.

(a) "**Air Pollutant**" - means any particulate matter or any gas or vapor other than water or any combination thereof including any physical, chemical, biological, radioactive substance or matter which is emitted into or otherwise enters the ambient air.

(b) "**Antique Motor Vehicle**" - means any motor vehicle over twenty-five (25) years old which is owned solely as a collectors' item and is used for participation in club activities, exhibits, tours, parades and similar uses, but in no event for general transportation.

(c) "**Carbon Dioxide**" - means a compound consisting of the chemical formula (CO_2).

(d) "**Carbon Monoxide**" - means a compound consisting of the chemical formula (CO).

(e) "**Catalytic Converter**" - means a pollution control device containing a catalyst for converting automobile exhaust into mostly harmless products.

(f) "**Certificate of Compliance**" - means a certification issued by a Department vehicle inspector or a fleet vehicle inspector that the motor vehicle identified on the certificate complies with the emission performance and anti-tampering criteria appropriate to the vehicle as specified in this Regulation.

(g) **"Check Engine Light"** - for the definition see Malfunction Indicator Light (MIL).

(h) "**Contractor**" - means a person, business, firm, partnership, or corporation with whom the Department has a contract which provides for the operation of one or more official inspection stations.

(i) "**Department**" – means the Department of Health of the Metropolitan Government, including the Metropolitan Board of Health, agents, employees, and divisions.

(j) "**Department Vehicle Inspector**" - means any person employed by the Department and/or contractor who is certified by the Director as qualified to perform vehicle emissions performance and anti-tampering inspections.

(k) **"Diagnostic Trouble Codes (DTC's)"** – is an alphanumeric code which is set in a vehicle's onboard computer when a monitor detects a condition likely to lead to (or has already produced) a component or system failure or otherwise contribute to exceeding emissions standards by 1.5 times the certification FTP standard.

(l) ~~"**Diesel Powered Motor Vehicle**" - means a motor vehicle powered by a compression-ignition internal combustion engine.~~

(m) ~~"**Director**" - means the chief administrative officer of the Metropolitan Board of Health or his designated representative.~~

(n) ~~"**Electric Powered Motor Vehicle**" - means a motor vehicle which uses a propulsive unit powered exclusively by electricity.~~

(o) ~~"**Emission**" - means the act of releasing or discharging air pollutants into the ambient air from any source.~~

(p) ~~"**Exhaust Emissions**" - means substances emitted into the atmosphere from any opening downstream from the exhaust ports of a motor vehicle engine.~~

(q) ~~"**Exhaust Gas Analyzer**" - means a device for sensing the amount of air pollutants, including carbon monoxide and hydrocarbons, in the exhaust emissions of a motor vehicle. For the purposes of this Regulation, this shall mean analyzing devices of the non-dispersive infrared type or any other analyzing device that provide equal or greater accuracy as approved by the Director.~~

(r) ~~"**Factory-installed Motor Vehicle Pollutant Control System**" - means a motor vehicle pollution control system installed by the vehicle or engine manufacturer to comply with United States government motor vehicle emission control laws and regulations.~~

(s) ~~**"Federal Test Procedure (FTP)"** - is the test procedure used to determine the compliance of vehicles with federal emission standards.~~

(t) ~~"**Fleet**" - means fifty (50) or more light duty motor vehicles owned by the same person or business entity which are in use, registered in Davidson County, and not owned or held primarily for the purpose of resale.~~

(u) ~~"**Fleet Inspection Location**" - means any motor vehicle inspection facility operated by a fleet operator holding a valid fleet inspection permit.~~

(v) ~~"**Fleet Inspection Permit**" - means a certificate issued by the Director authorizing a fleet operator to conduct motor vehicle inspection sin accordance with this Regulation and other requirements as determined by the Department.~~

(w) ~~"**Fleet Operator**" - means the person owning a group of motor vehicles which constitute a fleet as defined in this regulation.~~

(x) ~~"**Fleet Vehicle Inspector**" - means any person retained by a fleet operator holding a valid fleet inspection permit and who is certified by the Director as qualified to perform vehicle emissions performance and anti-tampering inspections.~~

(y) ~~"**Gasoline Inlet Restrictor**" - means the leaded fuel nozzle restrictor installed on motor vehicles which was designed for the use of unleaded gasoline only.~~

(z) ~~"**Gasoline Powered Motor Vehicle**" - means any motor vehicle powered by a spark-ignition internal combustion engine.~~

(aa) ~~"**GVWR**" - means the gross vehicle weight as determined from combined manufacturer vehicle and maximum load rating.~~

(bb) ~~"**Heavy-duty Motor Vehicle**" - means any motor vehicle having a combined manufacturer vehicle and maximum loading rate (GVWR) to be carried thereon in excess of 10,500 pounds (4773 kilograms or more).~~

(cc) ~~"**Hydrocarbon**" - means a class of chemical compounds consisting of hydrogen and carbon.~~

(dd) ~~"**Idle Speed**" - means the unloaded engine speed of a motor vehicle when the accelerator pedal is fully released. In a vehicle equipped with an automatic transmission the drive selector shall be in neutral or park. In a vehicle equipped with a manual transmission, the gear selector shall be in neutral and the clutch fully engaged. In all vehicles, engine operated accessories shall be turned off.~~

(ee) ~~"**Internal Combustion Engine**" - means any engine in which the combustion of gaseous, liquid or pulverized solid fuel takes place within one or more cylinders.~~

(ff) ~~"**Light-duty Motor Vehicles**" - means any motor vehicle having a combined manufacturer vehicle and maximum load rating to be carried thereon (GVWR) of not more than 10,500 pounds (4773 kilograms).~~

(gg) ~~**"Malfunction Indicator Light (MIL)"** – is known as the Check Engine light. The Malfunction Indicator Light is illuminated on the dashboard when conditions exist likely to result in emission exceeding FTP standards by 1.5 times or worse. Alternatives include "Service Engine Soon", as well as an unlabeled icon of an engine.~~

(hh) ~~"**Manufacturers Idle-speed Specifications**" - means the engine idle speed specified for a particular motor vehicle as printed on the engine compartment emissions system data plate or in the owners manual.~~

(ii) ~~"**Metropolitan Motor Vehicle Regulatory License**" - means the annual motor vehicle license required by Section 5.32.140 of the Metropolitan Code as a condition for legal operation of certain classes of motor vehicles.~~

(jj) ~~"**Metropolitan Wheel Tax**" - means the annual commercial vehicle tax required by Section 5.32.020 of the Metropolitan Code as a condition for legal operation of certain classes of motor vehicles.~~

(kk) ~~"**Model Year**" - means annual production period of new motor vehicles or new motor vehicle engine designated by the calendar year in which such production ends. If the manufacturer does not designate a production period, the year with respect to such vehicles or engines shall mean the twelve (12) month period beginning January of the year in which production thereof begins. The model year of a motor vehicle constructed by other than the original manufacturer shall be assigned by the Director.~~

(ll) ~~"**Motor Vehicle**" - means any self-propelled vehicle used for transporting persons or commodities on public roads.~~

(mm) ~~"**Motorcycle**" - means any motor vehicle having a seat or saddle for the use of the rider and designed to travel on not more than three wheels in contact with the ground and having a curb weight of 2000 pounds (907 kilograms) or less.~~

(nn) ~~"**New Motor Vehicle**" - means any motor vehicle that has never been previously titled or registered in this or any other jurisdiction and whose ownership document remains as a manufacturer's certificate or origin.~~

(oo) "**Official Inspection Station**" - means a facility operated by the Department and/or contractor to conduct motor vehicle inspections pursuant to this Regulation.

(pp) **"Onboard Diagnostics (OBD)"** – is a system of vehicle component and condition monitors controlled by a central, onboard computer designed to signal the motorist when conditions exist which could lead to a vehicle's exceeding its certification standards by 1.5 times the FTP standard.

(qq) **"OBD Data Link Connector (DLC)"** – is the interface which is usually located under the dashboard on the driver's side between a vehicle's OBD computer and the OBD scanner. Connecting an OBD scanner to the DLC allows inspectors and vehicle repair technicians to read the readiness status of the vehicle's various onboard monitors as well as any diagnostic trouble codes.

(rr) "**Opacity**" - means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background.

(ss) "**Person**" - means any individual natural person, trustee, court-appointed representative, syndicate, association, partnership, firm, club, company, corporation, business trust, institution, agency, government corporation, municipal corporation, city, county, municipality, district or other political subdivision, department, bureau, agency or other entity recognized by law as the subject of rights and duties, and any officer, agent, or employee thereof. The masculine, feminine, singular, or plural is included in any circumstances.

(tt) "**Pollution Control Device**" – means equipment designed by the manufacturer for installation on a motor vehicle for the purpose of reducing pollutants emitted from the vehicle, or a system or engine modification on a motor vehicle which causes a reduction of pollutants emitted from the vehicle.

(uu) **"Readiness Codes"** – are status flags stored by a vehicle's onboard computer which is different from the DTC in that it does not indicate a vehicle fault, but rather whether or not a given monitor has been run (i.e., whether or not the component or system in question has been checked to determine if it is functioning properly).

(vv) "**PPM**" - means parts per million by volume.

(ww) "**RPM**" - means engine crankshaft revolutions per minute.

(xx) "**Tampering**" - means to remove, render inoperative, cause to be removed, or make less operative any emission control device, unless such removal or act to render inoperative or less operative is for the purpose of motor vehicle disposal or salvage operation.

(yy) "**Vehicle Exhaust System**" - means all devices, equipment and systems which transport exhaust emissions from the exhaust ports of the motor vehicle engine to the atmosphere.

~~SECTION 8-2: Motor Vehicle Inspection Requirements~~

~~(a) All light-duty motor vehicles either registered in Davidson County, or directly with the motor vehicle division of the Tennessee Department of Revenue pursuant to T.C.A. 55-4-207 and used within or assigned to user within Davidson County, except those exempted in Section 8-3 of this Regulation, are required to be inspected annually for compliance with the emissions performance and anti-tampering criteria provisions of Sections 8-4 and 8-5 of this Regulation. Owners of vehicles so inspected are required to obtain a Certificate of Compliance. A Certificate of Compliance shall be valid for 90 days following the date of issuance, except for those registered pursuant to T.C.A. 55-4-207, which shall be valid for one year.~~

~~(b) A Certificate of Compliance shall be issued only by a Department and/or contractor vehicle inspector and only after the vehicle demonstrates compliance with the test criteria established in Sections 8-4 and 8-5 of this Regulation.~~

~~(c) All light-duty motor vehicles required to obtain a Certificate of Compliance except those vehicles contained in a fleet which has a valid fleet inspection permit and those vehicles registered in Davidson County but not subject to either the Metropolitan Wheel Tax or the Metropolitan Motor Vehicle Regulatory License requirements shall obtain a valid Certificate of Compliance within ninety (90) days prior to the required date for payment of the wheel tax or the motor vehicle regulatory license fee as appropriate to the class of motor vehicles.~~

~~(d) All light-duty motor vehicles required to obtain a Certificate of Compliance and which are either contained in a fleet having a valid fleet inspection permit or are vehicles registered in Davidson County but exempted from the Metropolitan Wheel Tax and Metropolitan Motor Vehicle Regulatory License requirements shall obtain a valid Certificate of Compliance within ninety (90) days prior to a compliance date for that particular motor vehicle. A schedule of compliance dates for such vehicles shall be established by the Director.~~

~~(e) The Certificate of Compliance must be presented prior to the issuance of the Metropolitan Wheel Tax or the Metropolitan Vehicle Regulatory License.~~

~~SECTION 8-3: Exemption From Motor Vehicle Inspection Equipment~~

~~(a) The following classes of motor vehicles are exempted from the requirement established in Section 8-2 of this Regulation.~~

~~(1) New motor vehicles being registered for the first time;~~

~~(2) Heavy duty motor vehicles;~~

~~(3) Motorcycles;~~

~~(4) Antique motor vehicles;~~

~~(5) Electric-powered light-duty motor vehicles; and~~

(6) Gasoline-powered light-duty motor vehicles with a designated model year prior to 1975.

(b) When a motor vehicle is equipped with other than the original engine, the vehicle shall be classified for purposes of the emission performance test by the model year of the chassis.

SECTION 8-4: Motor Vehicle Emission Performance Test Criteria

(a) Vehicles shall not be allowed to complete emission performance testing if one or more of the following conditions exist when the vehicle is presented for testing:

(1) For 1975 to 1995 model vehicles if the vehicle exhaust system leaks in such a way as to dilute the exhaust emissions being sampled by the exhaust gas analyzer; the sum of carbon monoxide and carbon dioxide concentrations recorded for the idle speed reading from an exhaust outlet must not be less than six (6) percent; and

(2) The visible emission from the gasoline-powered vehicles is such that it would interfere with operation of the emission test equipment.

(b) Vehicle models 1975 to 1995 with idle speed emission values, which exceed the test standards specified in Table 1, shall fail the emission performance test.

TABLE 1

MAXIMUM IDLE SPEED EMISSIONS ALLOWABLE

DURING IDLE SPEED EMISSIONS TEST

	CO %		**HC (PPM)**	
Vehicle Model Year	Light-Duty Vehicles Less Than Or Equal To 6000 Lbs. GVWR	Light-Duty Vehicles Greater Than 6000 Lbs. GVWR	Light-Duty Vehicles Less Than Or Equal To 6000 Lbs. GVWR	Light-Duty Vehicles Greater Than 6000 Lbs. GVWR
1975	5.0	6.5	500	750
1976	5.0	6.5	500	750
1977	5.0	6.5	500	750
1978	4.0	6.0	400	600
1979	4.0	6.0	400	600
1980	3.0	4.5	300	400
1981 And Newer	1.2	4.0	220	400

(3) Light-duty diesel-powered motor vehicle models 1975 through 2001 shall be subject to the Curb Idle test as follows:

(i) A diesel vehicle shall not emit visible emission in excess of ten (10) percent opacity for ten (10) or more consecutive seconds, as measured at idle engine speed.

(4) All 1996 and newer gasoline-powered motor vehicles and all 2002 and newer diesel-powered motor vehicles shall be subject to an OBD inspection. An OBD check shall consist of two parts. A visual check of the MIL and an electronic examination of the OBD computer. The vehicle is required to pass a MIL command on test and a bulb check test. After the vehicle has passed the MIL command on test and the bulb check test, it must not have any DTC set and all of the required readiness codes must be set in order to pass an OBD inspection.

SECTION 8-5: Motor Vehicle Anti-Tampering Test Criteria

(a) Each gasoline-powered motor vehicle subject to an emission performance test under this Regulation is also subject to visual anti-tampering inspection and shall comply with the following minimum anti-tampering requirements:

(1) At a minimum, the emission control devices subject to an inspection are the catalytic converter, and fuel filler cap. If emission control devices are found in a tampered condition, such devices shall be replaced prior to any retesting or reinspection as provided for in Section 8-9(c).

(2) Each gasoline-powered motor vehicle subject to an OBD inspection is also subject to an anti-tampering test, and shall comply with a DLC check and a fuel cap pressure test.

(3) Each diesel-powered motor vehicle subject to an emission performance test is also subject to an anti-tampering test and shall comply at a minimum with a catalytic converter check, if applicable, and a fuel cap check.

(4) Each diesel-powered motor vehicle subject to an OBD inspection is also subject to an anti-tampering test, and shall comply with a DLC check and fuel cap check.

SECTION 8-6: Motor Vehicle Emissions Performance Test Methods

(a) For gasoline-powered motor vehicles, the motor vehicle emissions performance test shall consist of the sampling of exhaust emissions at idle speed and measurement of CO_2 dilution, CO concentration and HC concentration.

(b) For gasoline-powered motor vehicles, sampling of exhaust emissions shall consist of measurement of CO_2 dilution, CO concentration and HC concentration during idle operation using an approved exhaust gas analyzer. Measurements taken during the initial idle phase may be succeeded by measurements taken during a second idle phase which has followed an engine conditioning phase consisting of engine operation at approximately 2500 RPM for approximately 20 seconds. The lowest emission readings

from either of these idle speed test phases shall be used to determine pass or failure of the emissions performance test.

(c) For diesel-powered motor vehicles, the motor vehicle emission performance test shall consist of the Curb Idle test procedures for diesel vehicles as follows:

(1) Diesel-powered vehicles shall be inspected with an opacity meter that is a full-flow, direct reading, continuous reading light extinction type using a collimated light source and photo-electric cell, accurate to within plus or minus five (5) percent.

(2) Separate measurements shall be made on each exhaust outlet on diesel vehicles equipped with multiple exhaust outlets. The reading taken from the outlet giving the highest reading shall be used for comparison with the standard for the vehicle being tested.

(d) For gasoline-powered motor vehicles with a model year of 1996 and newer and for diesel-powered motor vehicles with a model year of 2002 and newer, an Onboard Diagnostic test shall be performed. All vehicles that have a readily accessible OBD system shall be tested. The results of the test shall be used to determine pass or failure of the vehicle.

SECTION 8-7: Motor Vehicle Anti-Tampering Test Methods

(a) For 1975 to 1995, the motor vehicle anti-tampering test shall consist of the following:

(1) The vehicle will be visually checked to see that the appropriate fuel cap is securely in place. If the appropriate fuel cap is not in place, it will result in the failure of the anti-tampering test.

(2) The vehicle will be visually checked to see if the catalytic converter is the correct type for the certified vehicle configuration and is properly installed. If the catalytic converter has been tampered with, removed, or is the incorrect configuration, it will result in the failure of the anti-tampering test.

(b) Each gasoline-powered motor vehicle with a model year of 1996 and newer is subject to an anti-tampering test, and shall comply with the DLC and a fuel cap pressure test. The anti-tampering test shall consist of the following elements:

(1) Vehicle shall be visually checked to see if the appropriate fuel cap is securely in place.

(2) If the fuel cap is present, it shall be removed and a fuel cap pressure test shall be performed to assure the cap is working properly. (Federal Test Procedures 26-21 Pass/Fail Standard). If the fuel cap fails the pressure test, it shall result in a failure of the anti-tampering test.

(3) If the DLC has been tampered with or is missing, it must be repaired or replaced prior to any retesting or reinspection. If the vehicle is incompatible with OBD test equipment or is readily unavailable, then the vehicle is required to pass the idle speed emission values specified in Section 8-4(b).

(c) Each diesel-powered motor vehicle with a model year of 2002 and newer is subject to an anti-tampering test, and shall comply at a minimum with a DLC check and a fuel cap check. The anti-tampering test shall consist of the following elements:

(1) Vehicle shall be visually checked to see if the appropriate fuel cap is securely in place.

(2) If the DLC has been tampered with or is missing, it must be repaired or replaced prior to any retesting or reinspection. If the vehicle is incompatible with the OBD test equipment or if the DLC is readily unavailable, then the vehicle is subject to the Curb Idle test as specified in Section 8-6 (c-1-2).

(d) A pass/fail determination will be made for each of the test elements in Paragraph (a), (b), or (c). If a vehicle fails any of the elements in paragraph (a), (b), or (c), it will result in the failure of the motor vehicle inspection and a Certificate of Compliance will not be issued until the repairs have been made to the vehicle.

SECTION 8-8: Motor Vehicle Inspection Program

(a) The motor vehicle inspection program shall be operated by the Metropolitan Public Health Department or contractor.

(b) All vehicle inspections shall be conducted at official inspection stations operated by the Department and/or contractor except those fleet inspections provided for in Section 8-8(c) of this Regulation.

(c) In lieu of the requirement in Section 8-8(b) of this Regulation, vehicles owned or operated by a fleet operator to whom a fleet inspection permit has been issued may be inspected by a licensed fleet vehicle inspector at a site other than an official inspection station.

(d) A light-duty fleet vehicle operator may make application to the Director for a fleet vehicle inspection permit. Minimum requirements for issuance of a permit shall be:

(1) Possession of an approved exhaust gas analyzer, tools and equipment determined by the Director to be adequate for conducting the required emissions inspection;

(2) Demonstration of knowledge of methods and procedures for conducting required emissions performance and anti-tampering inspections according to criteria developed by the Director;

(3) Provision of appropriate facility for vehicle testing and appropriate secure storage facility for storage of Certificates of Compliance and records of inspections;

(4) Agreement to supply inspection and Certificate of Compliance issuance information as requested by the Director and to allow access to testing facility, testing equipment, testing personnel, testing data, Certificate of Compliance inventory and fleet vehicles as requested by the Director; and

(5) Retention of licensed fleet vehicle inspector to conduct fleet vehicle inspections.

(e) A fleet inspection permit shall be valid for one year from date of issuance and may be renewed through application to the Director within thirty (30) days prior to the date of expiration. A fleet inspection permit is not transferable and may be denied, suspended or revoked by the director for failure to comply with this Regulation and other requirements as determined by the Department.

(f) A person employed or retained by a fleet operator holding a valid fleet inspection permit may make application to the Director for a fleet vehicle inspector's license. Minimum requirements for issuance of this license shall be:

(1) Successful completion of a vehicle inspector training course prepared and offered by the Department;

(2) Successful completion of mechanics training course approved by the Director;

(3) Agreement to participate in additional training activities from time to time as specified by the Director; and

(4) Provision of written evidence that applicant is employed or retained by the fleet operator.

(g) A fleet inspector's license shall be valid for one year from date of issuance and may be renewed through application to the Director within thirty (30) days prior to the date of expiration. A fleet vehicle inspector's license is not transferable and may be denied, suspended or revoked by the Director for failure to comply with this Regulation and other requirements as determined by the Department.

(h) All vehicles issued Certificate of Compliance under the provisions of Section 8-8(c) of this Regulation shall be subject to retesting at either the fleet inspection location or an official inspection station as deemed necessary by the Director in order to maintain compliance with the intent of this Regulation.

~~SECTION 8-9: Motor Vehicle Inspection Fee~~

~~(a) There shall be a fee of $9.00 dollars for each emission test payable at the time of inspection unless the vehicle qualifies for an inspection without charge as specified in Paragraph (c).~~

~~(b) There shall be a fee of $5.00 dollars for each Certificate of Compliance supplied to licensed fleet inspectors for issuance to motor vehicles which comply with the testing provisions of this Regulation.~~

~~(c) Each vehicle which fails its initial inspection is entitled to one reinspection at no charge if the vehicle is accompanied by the entire initial inspection report.~~

~~(d) Motor vehicle owners or operators shall be given in writing the results of all inspection procedures carried out at any official inspection station.~~

~~(e) There shall be a fee of fifty ($50.00) dollars for each initial annual Fleet Vehicle Inspector's License issued to a fleet vehicle inspector; there shall be a fee of fifteen ($15.00) dollars for each annual renewal of a Fleet Vehicle Inspector's License.~~

~~SECTION 8-10: Severability~~

~~The provisions of any Part, Section, Subsection, Paragraph, phrase or clause of this Regulation that shall be adjudged invalid or unconstitutional by any court of competent jurisdiction, the judgment shall not affect, compare, or invalidate the remainder of this Regulation, but should be confined in its operation to the Part, Section, Subsection, Paragraph, phrase or clause of this Regulation that shall not be directly involved in the controversy in which such judgment shall have been redeemed.~~

Appendix C

Onroad Mobile

Source Emissions

Appendix C Onroad Mobile Source Emissions

1.0 INTRODUCTION

This appendix documents the process used in the development of the onroad mobile sources emissions inventory. The development of the onroad emissions inventory was conducted in conjunction with the Davidson County Division of Pollution Control, with assistance from the Nashville Metropolitan Planning Organization.

Onroad mobile sources emit a large variety of emissions, including carbon monoxide (CO), oxides of nitrogen (NO_x), volatile organic compounds (VOCs) and a number of other pollutants. These are the pollutants considered in this analysis. The year determined to be the most appropriate year for scenario comparison is 2022. The emissions comparisons are conducted for an annual emissions inventory. To estimate emissions, as much locally developed data was used as possible to provide input to EPA's most current version of the MOVES model.

2.0 METHODOLOGY

The onroad mobile source emissions for the Motor Vehicle Inspection and Maintenance (I/M) areas were estimated using the latest version of EPA's MOVES emission factor model. The version of the model used is the MOVES2014b version with the 20180517 database. The input parameters for the model runs were developed, reviewed and agreed to through a collaborative process including the state air agency, local air agencies, MPOs, contractors and consultants as well as other interested stakeholders.

Future VMT and other vehicle activity estimates were provided by the Nashville Metropolitan Planning Organization (MPO) based on travel demand modeling performed for Middle Tennessee (Mid TN). A summary of the modeling inputs used and the results of the emission estimates are described in this document. Onroad emissions for 2022 were developed jointly by the State of Tennessee and the Davidson County Pollution Control Division.

In December 2009, the EPA released a new model for onroad mobile sources. MOVES (MOtor Vehicle Emissions Simulator) is a computer program designed by the EPA to estimate air pollution emissions from onroad mobile sources. MOVES2010 replaces the EPA's previous emissions model for onroad mobile sources, MOBILE6.2. In October of 2015, EPA released MOVES2014, with the most recent version of MOVES2014b released in August of 2018. MOVES can be used to estimate exhaust and evaporative emissions as well as brake and tire wear emissions from all types of onroad vehicles.

MOVES can either export emissions factors or emissions inventories. If emissions factors are exported, the output will need to be post-processed. These emissions factors will need to be multiplied by vehicle population and vehicle miles traveled. Alternatively, if the VMT and vehicle population, are input into MOVES, MOVES can conduct the post-processing internally and output total emissions for a selected period of time. For simplicity and consistency, the onroad emissions inventories developed in this document were developed using MOVES' emissions inventory output option.

The objective of the following section is to describe the input files and the emissions estimation procedures. This document also includes tables summarizing the estimated emissions for the various scenarios. Onroad mobile source emissions are estimated by the methodologies suggested in the Environmental Protection Agency's (EPA) Technical Guidance[1] ("Technical Guidance").

2.1 MOVES RUNSPEC Parameters

In setting up a MOVES run, a number of parameters need to be established to define the timespan, geographic bounds, vehicle and road types, pollutants and output options for the run. Which options are selected can have an impact on the overall result. The specifics for the 'runspec' (sic) or, the specifications for a particular MOVES run saved in an ".mrs" file, are outlined below.

- Scale: County level scale – Inventory mode
- Time Span: year (2022), by hour, for all months, all days, all hours
- Geographic bounds: County level for each of the Mid TN Counties
- Vehicles/Equipment: Gasoline, CNG, ethanol (E85) and diesel fuels, all valid vehicle combinations
- Road type: All
- Pollutants and Processes: NO_x, CO and VOC and all other required supporting prerequisite pollutants
- Output options:
    - General:
        - Units: grams, joules, miles
        - Activity: Distance Traveled, Population
    - Output Emissions Detail:
        - Always: Time: Hour, Location: County

[1] *MOVES2014, MOVES2014a, and MOVES2014b Technical Guidance: Using MOVES to Prepare Emissions Inventories for State Implementation Plans and Transportation Conformity*, US EPA, EPA-420-B-18-039, August 2018.

- All Vehicle/Equipment Categories: Model year, Fuel Type
- On road: Road Type, Source Use Type

Once the runspec is developed for each county and year combination, the input data can be imported through the County Data Manager. A separate run needs to be executed for each county and scenario.

3.0 MOVES INPUT DATA

Due to the size and the complexity of the MOVES input and output files, the MOVES input files and output files will be provided electronically. Some of the smaller datasets, or parts of datasets, for illustration, are included in this document. MOVES requires a large amount of locally developed data in order to complete a MOVES run. Some of the inputs required include vehicle population, vehicle miles traveled (VMT), speeds, meteorology, day, month and hour fractions, and distribution of the VMT on different road types (road type distribution). Some of this data was developed by the Tennessee Department of Transportation (TDOT). Details on how some of these data elements were developed by TDOT are contained in the document titled: *Methodology for Developing Input Datasets for the MOVES Model*, contained in Appendix D of this document. The development of other MOVES inputs is described in the sections below.

3.1 Meteorology

Local temperature and humidity data are required inputs for MOVES. Ambient temperature is a key factor in estimating emission rates for onroad vehicles with substantial effects on most pollutant processes. Relative humidity is also important for estimating NO_x emissions from motor vehicles. MOVES requires a temperature (in degrees Fahrenheit) and relative humidity (in percent) by hour. MOVES requires a 24-hour temperature and humidity profile to model a full day of emissions on an hourly basis. The MOVES Technical Guidance provides guidance on the selection of temperature profiles for use in Transportation Conformity determinations and State Implementation Plans (SIPs).

Available data for Tennessee was obtained from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center (NCDC) at: http://www.ncdc.noaa.gov/oa/ncdc.html. Data was captured for all weather stations in Tennessee that collected hourly temperature and relative humidity data. Observations were collected only for those observations that were 'on the hour'. After the data was compiled and formatted, the data was reviewed to determine data completeness. The data was then compiled for the nearest location – the Nashville International Airport in Davidson County.

The data used was averaged by month from years 2015, 2016 and 2017. January's meteorological data for Mid TN is illustrated in Table 1 below.

Table 1. Sample Temperature and Humidity Data.

monthID	zoneID	hourID	temperature	relHumidity
1	470370	1	38	72
1	470370	2	38	73
1	470370	3	37	74
1	470370	4	37	75
1	470370	5	37	76
1	470370	6	36	76
1	470370	7	35	77
1	470370	8	37	76
1	470370	9	39	71
1	470370	10	41	68
1	470370	11	43	62
1	470370	12	45	59
1	470370	13	46	58
1	470370	14	48	55
1	470370	15	48	54
1	470370	16	47	55
1	470370	17	45	58
1	470370	18	43	61
1	470370	19	42	64
1	470370	20	41	66
1	470370	21	40	68
1	470370	22	40	70
1	470370	23	39	71
1	470370	24	38	72

3.2 Source Type Population

Source type (i.e., vehicle type) population is used by MOVES to calculate start and evaporative emissions. In MOVES, start and resting evaporative emissions are related to the population of vehicles in an area. Since vehicle type population directly determines start and evaporative emission, users must develop local data for this input. MOVES classifies vehicles based on the way vehicles are classified in the Federal Highway Administration's HPMS (Highway Performance Monitoring System) system rather than on the way they are classified in the EPA's emissions regulations.

MOVES categorizes vehicles into 13 source types, which are subsets of 6 HPMS vehicle types, as shown in the crosswalk in Table 2. The EPA believes that states should be able to develop population data for many of these source type categories from state motor vehicle registration data (e.g., motorcycles, passenger cars, passenger

trucks and light commercial trucks) and from local transit agencies, school districts, bus companies, and refuse haulers (intercity, transit, school buses and refuse trucks).

Table 2. Source Type Definitions and Crosswalk to HPMS Vehicle Type ID.

MOVES Source Type ID	HPMS Vehicle Type ID	Source Type Name	Definition
11	10	Motorcycle	Vehicles with less than four wheels.
21	20	Passenger Car	Four wheel, two axle vehicles whose primary function is passenger transport.
31	30	Passenger Truck	Four wheel, two axle trucks whose primary functional design is for cargo, but are used primarily for passenger transport.
32	30	Light Commercial Truck	Four wheel, two axle trucks used primarily for cargo transport.
41	40	Intercity Bus	Passenger vehicles with a capacity of 15 or more persons primarily used for transport between cities.
42	40	Transit Bus	Passenger vehicles with a capacity of 15 or more persons primarily used for transport within cities.
43	40	School Bus	Passenger vehicles with a capacity of 15 or more persons used primarily for transport of students for school.
51	50	Refuse Truck	Trucks primarily used to haul refuse to a central location.
52	50	Single Unit Short-haul Truck	Single unit trucks with more than four tires with a range of operation of up to 200 miles.
53	50	Single Unit Long-haul Truck	Single unit trucks with more than four tires with a range of operation of over 200 miles.
54	50	Motor Home	Trucks whose primary functional design is to provide sleeping quarters.
61	60	Combination Short-haul Truck	Combination tractor/trailer trucks with more than four tires with a range of operation of up to 200 miles.
62	60	Combination Long-haul Truck	Combination tractor/trailer trucks with more than four tires with a range of operation of over 200 miles.

TDOT developed source type populations for the Mid TN Counties for 2014. See the *Methodology for Developing Input Datasets for the MOVES Model* in Appendix D for a detailed description of how source type population was developed at the county level.

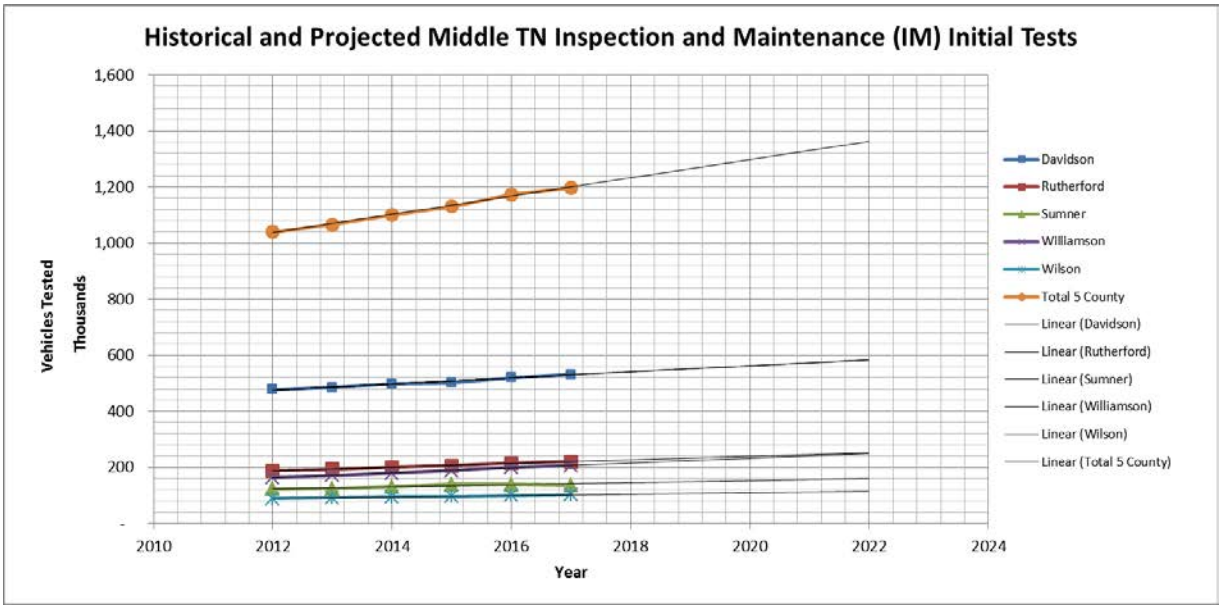
After examining the source type populations for passenger cars, passenger trucks and light commercial trucks (source types 21, 31 and 32), and comparing those to historical

vehicle inspection and maintenance data, it was determined that the vehicle population for these source types was underestimated. Historical vehicle population subject to Inspection and Maintenance (I/M) was plotted and used to project vehicle population for the applicable source types for calendar year 2022. See Table 3 and Figure 1 for historical values and projections of the number of vehicles with initial I/M tests in the Mid TN Counties.

Table 3. Historical and Projected Mid TN Inspection and Maintenance (I/M) Initial Tests.

Historical (2012-2017) and Projected (2018-2022) Mid TN Inspection and Maintenance (I/M) Initial Tests						
Year	**Davidson**	**Rutherford**	**Sumner**	**Williamson**	**Wilson**	**Total 5 County**
2012	477,479	188,029	122,720	163,346	88,707	1,040,281
2013	485,005	192,966	125,198	171,183	90,839	1,065,191
2014	497,525	199,192	130,888	179,113	94,214	1,100,932
2015	501,508	205,674	139,618	188,320	95,390	1,130,510
2016	520,383	214,881	139,519	199,481	99,731	1,173,995
2017	530,622	220,891	137,364	206,292	101,515	1,196,684
2018	539,670	227,259	145,042	215,506	104,255	1,231,733
2019	550,408	234,017	148,611	224,329	106,881	1,264,247
2020	561,146	240,776	152,180	233,153	109,506	1,296,762
2021	571,884	247,534	155,749	241,977	112,132	1,329,276
2022	582,622	254,292	159,318	250,801	114,757	1,361,790

Figure 1. Historical and Projected Mid TN Inspection and Maintenance (I/M) Initial Tests.



From this information, the number of vehicles in 2022 for source type categories 21, 31 and 32 for all five Mid TN Counties was projected at 1,361,790. These vehicles were apportioned into the three MOVES source types (21, 31 and 32) in the same proportion as the existing data.

Source type population projections for the remaining source types to 2022 for Mid TN were based on growth in household vehicle ownership and commercial truck trip growth derived from the Nashville Area MPO's Travel Demand Model (TDM). The TDM has a vehicle ownership sub-model that allocates vehicle ownership based on population. The vehicle ownership sub-model is used by the TDM to determine vehicle mode choice and vehicle activity. As people population increases, the TDM adjusts the vehicle ownership in accordance with population growth. The change in passenger vehicle population is used to grow motorcycle (source types 11) populations derived from vehicle registration data for 2014.

Source type population for the remaining source types was derived from the growth in commercial truck trips in the TDM and applied to source types 52, 53, 54, 61 and 62. Growth in buses and refuse trucks (source types 41, 42, 43 and 51) was grown based on the growth in commercial truck trips as well. Table 4 illustrates the source type population developed for 2022.

Table 4. Source Type Population Projections for Mid TN in 2022.

Vehicle Type	MOVES Source Type ID	Source Type Population 2022				
		Davidson	Rutherford	Sumner	Williamson	Wilson
Motorcycle	11	11,233	7,992	5,921	5,845	4,212
Passenger Car	21	324,177	139,019	86,521	136,657	62,003
Passenger Truck	31	206,060	91,902	58,046	90,993	42,052
Light Commercial Truck	32	52,384	23,371	14,751	23,151	10,702
Intercity Bus	41	15	4	1	4	3
Transit Bus	42	403	11	-	27	-
School Bus	43	932	363	281	356	263
Refuse Truck	51	402	138	55	117	76
Single Unit Short-haul Truck	52	12,807	4,869	2,951	3,079	2,527
Single Unit Long-haul Truck	53	589	202	86	160	105
Motor Home	54	3,641	1,239	547	952	622
Combination Short-haul Truck	61	7,285	2,111	606	1,763	1,267
Combination Long-haul Truck	62	7,942	2,298	652	1,937	1,391
Total		627,870	273,519	170,418	265,041	125,223

3.3 Age Distribution

The age distribution of the vehicle fleet can vary significantly from area to area. Fleets with a higher percentage of older vehicles will typically have higher emissions for two reasons: older vehicles have typically been driven more miles and have experienced more deterioration in the emission control system and older vehicles generally do not meet newer, more stringent emissions standards.

For SIP and conformity purposes, the EPA recommends and encourages states to develop local age distribution data. The MOVES model categorizes the vehicle fleet

into a 31 year range of vehicle ages, with vehicles 30 years and older grouped together. MOVES requires the user to specify the fraction of vehicles in each of 30 vehicle ages for each of the 13 vehicle (or source) types.

Local age distributions, sometimes with considerable work, can be estimated from local vehicle registration data. The vehicle age distribution comes from annual registration data for Tennessee as prepared by TDOT. For this analysis, the age distribution was generated based on 2014 vehicle registration data.

EPA has published a tool to project age distribution from a base year (must be 2011 or later) out to a future year. When applying this tool to a sample of age distributions developed for Tennessee, the age distribution created appears to reflect a distribution closer to the national age distribution, and not so much a consistent aging of the local fleet. There does not appear to be a consistent effect on age distribution - depending on the form of the local age distribution for the base year, the future age distribution might make the fleet younger or older, on average. Application of the age distribution projection tool appears to diminish some of the 'localness' of the vehicle fleet. If a part of the fleet is relatively new, for example, school buses - applying the tool ages the fleet to more closely resemble the national age distribution. In this case, Tennessee has legislation limiting the age of school buses in use. Applying the tool distributes the school bus fleet ages outside of the legislated age range. For these reasons, the age distribution data was held constant between 2014, the year for which actual local age distribution data is available, and 2022. For additional information, see the report in Appendix D titled: *Methodology for Developing Input Datasets for the MOVES Model*.

3.4 Vehicle Type Vehicle Miles Traveled (VMT)

MOVES defines roadways into five different functional types (see Table 5). Most travel demand models use a different roadway classification system than MOVES. The Vehicle Miles Traveled (VMT) from the TDM are aggregated into the respective MOVES road types based on the mapping shown in Table 6.

Table 5. MOVES Road Types.

MOVES Road Types		Description
1	Off-Network	All locations where the predominant activity is vehicle starts, parking and idling (parking lots, truck stops, rest areas, freight or bus terminals)
2	Rural Restricted Access	Rural highways that can only be accessed by an on-ramp
3	Rural Unrestricted Access	All other rural roads (arterials, collectors, and local streets)
4	Urban Restricted Access	Urban highways or freeways that can only be accessed by an on-ramp
5	Urban Unrestricted Access	All other urban roads (arterials, collectors, and local streets)

Table 6. Federal Highway Administration Highway Functional System and MOVES Road Type ID.

Federal Highway Administration Highway Functional System	MOVES Road Type	MOVES Road Type ID
Rural interstate	Rural restricted access	2
Rural other principal arterial	Rural restricted access	2
Rural minor arterial	Rural unrestricted access	3
Rural major collector	Rural unrestricted access	3
Ruaral minor collector	Rural unrestricted access	3
Rural local	Rural unrestricted access	3
Urban interstate	Urban restricted access	4
Urban other freeways	Urban restricted access	4
Urban other principal arterial	Urban unrestricted access	5
urban minor arterial	Urban unrestricted access	5
Urban colector	Urban unrestricted access	5
Urban local	Urban unrestricted access	5

The Nashville MPO's TDM predicts average weekday traffic volumes for all major roadway classes. Daily VMT was obtained from the travel demand models and expanded to annual VMT for 2022. VMT for those road types (principally local roads) that were not represented in the TDM were grown from the base year HPMS VMT in proportion to a higher order road type classification (e.g. collector roads). Even though these lower order road types were not explicitly contained in the TDM, the VMT from these roads is accounted for and included in the emissions analysis. Source type annual VMT for 2022 are shown in Table 7.

Table 7. Source Type Annual Miles Traveled (VMT) for 2022.

Middle Tennessee 2022 Annual Vehicle Miles Traveled						
Vehicle Type	MOVES Source Type ID	Davidson	Rutherford	Sumner	Williamson	Wilson
Motorcycle	11	57,713,968	26,292,483	12,155,938	22,386,905	12,586,664
Passenger Car	21	4,634,801,869	1,989,586,973	754,843,360	1,701,881,665	925,300,575
Passenger Truck	31	3,182,297,691	1,408,527,116	538,075,392	1,254,170,726	662,022,498
Light Commercial Truck	32	913,590,380	411,283,269	156,965,408	354,734,966	196,040,173
Intercity Bus	41	63,015	33,036	34,162	27,376	25,002
Transit Bus	42	1,077,154	66,228	-	125,553	-
School Bus	43	649,925	497,666	1,593,460	404,447	363,839
Refuse Truck	51	13,330,589	4,372,578	9,344,581	5,224,103	3,218,185
Single Unit Short-haul Truck	52	319,896,217	102,930,408	293,103,105	89,442,084	62,515,507
Single Unit Long-haul Truck	53	15,865,508	5,199,065	11,868,915	5,803,116	3,611,621
Motor Home	54	11,403,222	3,707,775	8,777,445	4,014,639	2,487,548
Combination Short-haul Truck	61	175,962,149	86,151,150	29,115,618	56,230,707	41,437,374
Combination Long-haul Truck	62	597,742,508	292,225,031	97,610,284	192,506,485	141,754,651
Total:		9,924,394,196	4,330,872,778	1,913,487,668	3,686,952,773	2,051,363,637

EPA's MOVES model uses fractions to parse out monthly, daily, and hourly VMT. These fractions are often locally developed to represent local conditions as much as possible. The report developed by the University of Tennessee (UT) for TDOT discusses the development of month and day VMT fractions. These fractions were developed from historical 5-year average HPMS data. More information on the development of these fractions is available in Appendix D to this document.

The Nashville MPO developed hourly VMT distributions (the same distributions were assumed for all MOVES source types) from the TDM for each county and MOVES road type.

3.5 Average Speed Distribution

Average speed distribution is the speed of each source type by road type for each hour of the day. MOVES uses 16 speed bins to group source type speed fractions. These fractions represent the amount of time a source type spends traveling at that speed on a particular road type. Note, these fractions represent the time spent in these speed bins; these fractions do not reflect instantaneous speeds, but the average speed, including delays like congestion and traffic signals. Speed is a direct function of several roadway characteristics and the amount of congestion that is present.

Average speed distribution for the Mid TN area was developed by the TPO's TDM. Similar to the hourly VMT fractions, there is a need for post processing of the raw TDM outputs for average speeds on roadway links primarily for the disaggregated level of detail needed for MOVES inputs. The same speeds were assumed for all source types.

Not all of the local roads are contained in the TDM. The speeds for these facilities is assumed to be equivalent to the next higher order road type represented in the TDM.

3.6 Road Type Distribution

Road type distribution is the distribution of VMT on each roadtype by sourcetype. Travel demand models have the ability to generate distribution of VMT by roadtype. This VMT can then be summed into the MOVES road type categories. Road type distribution was provided by the Nashville MPO for the five Mid TN Counties for 2022.

3.7 Ramp Fractions

Ramp fractions are the fraction of VHT (vehicle hours traveled) spent on urban and rural restricted access ramps. This data is generated by the TDM and provided by the Nashville MPO for 2022.

3.8 Fuel Type and Technology

Fuel Type and Technology was formerly called Alternative Vehicle Fuels & Technology (AVFT). This data is now entered on the fuels tab in the County Data Manager in MOVES2014b. This input allows users to define the split between different fuel types, including gasoline, diesel, and CNG (compressed natural gas) for each vehicle type and model year.

EPA's guidance recommends the use of local data where available. Default information can be used where no local information is available. The default information for transit buses (sourceType 42) includes CNG buses as part of the fleet mix. In most areas of Tennessee there are no transit buses fueled with CNG. Therefore, at a minimum, these buses should be allocated to another fuel.

Nashville has several electric transit buses, however, since MOVES does not allow the electric transit bus combination, to be conservative, these fractions were added to the diesel bus fuelEngFraction. Table 8 illustrates a sample of the data developed into MOVES fuelEngFraction format. The last column, fuelEngFraction, contains the fraction of miles driven for each model year by fuel type (1 = gasoline, 2 = diesel, 3 = CNG).

Table 8. Example Local fuelEngFraction Developed for Mid TN Transit Buses.

sourceTypeID	modelYearID	fuelTypeID	engTechID	fuelEngFraction
42	2010	1	1	0
42	2010	2	1	1
42	2010	3	1	0
42	2011	1	1	0
42	2011	2	1	1
42	2011	3	1	0
42	2012	1	1	0
42	2012	2	1	1
42	2012	3	1	0
42	2013	1	1	0
42	2013	2	1	1
42	2013	3	1	0
42	2014	1	1	0
42	2014	2	1	1
42	2014	3	1	0
42	2015	1	1	0
42	2015	2	1	1
42	2015	3	1	0

EPA states in their Technical Guidance: “In making projections, users should assume no future changes in activity associated with alternate fuel or engine technologies unless those alternate fuels or technologies are required by regulation or law.”. This necessitates the assumption that all future-year analyses will need to have the same distribution.

3.9 Fuel Formulation and Supply

MOVES requires fuel formulation information for each county in the domain being modeled. Similarly, these formulations should also have the associated fuel supply, or the fraction of each fuel used, by month, in each county. EPA’s default data is derived and expanded from a series of samples taken at the PADD (Petroleum Administration Defense Districts) level.

EPA’s Technical Guidance suggests changing the values that reflect Reid Vapor Pressure (RVP) properties to the regulatory requirements in the area being modeled. MOVES default data generally contains lower RVP values in 2022 for Tennessee than the regulatory maximum permitted. To be conservative, and in following the Technical Guidance recommendations, fuel formulations for fuel subtypes 12 and 15 have been modified using the fuel wizard built into the MOVES2014b fuel tab in the county data manager to reflect the maximum allowable RVP for each month in Mid TN. Because some default fuel formulations were mapped to months with differing maximum RVP limits, fuel formulations were modified or added to reflect the maximum RVP for that month. In addition, since EPA anticipates (based on the fuel formulations and supply information in MOVES) that essentially all gasoline sold in Tennessee in 2022 will

contain at least nine percent ethanol, an additional 1.0 psi (pounds per square inch) waiver applies to RVP values to those fuels (subtype 12) containing ethanol that are eligible to receive the 1.0 psi waiver. Therefore, the RVP values developed are 1.0 psi above the listed regulatory maximum as allowed by the 1.0 psi waiver for subtype 12 fuels (Table 9).

Table 9. Tennessee's Regulatory RVP Limits.

Tennessee's Maximum Reid Vapor Pressure (RVP) Requirement for Gasoline	
Month	**--- psi ---**
January	15.0
February	13.5
March	13.5
April	13.5
May	9.0
June	9.0
July	9.0
August	9.0
September (1-15)	9.0
September (16-30)	11.5
October	13.5
November	13.5
December	15.0

3.10 Motor Vehicle Inspection and Maintenance (I/M)

I/M programs are an important local control measure in many nonattainment and maintenance areas. MOVES includes the ability to model the essential design elements of an I/M program.

Five Mid TN Counties have an I/M program in place: Davidson, Rutherford, Sumner, Williamson and Wilson Counties. The Nashville/Davidson County Metropolitan Health Department, Division of Pollution Control has responsibility for operation of the I/M program in Davidson County. The Tennessee Department of Environment and Conservation, Air Pollution Control Division has responsibility for the operation of the I/M program in Rutherford, Sumner, Williamson and Wilson Counties, which began on December 1, 1994. Davidson County began emissions testing in 1985. Motor vehicles subject to emissions testing include vehicles with a model year (MY) beginning in 1975, excluding those vehicles that are one year-old or less. Vehicles with a GVWR of up to 10,500 pounds are subject.

Gasoline fueled motor vehicles subject to the I/M program that are model year 1975 through 1995 receive a "tailpipe" test. The tailpipe test is administered by inserting a probe in the vehicle's tailpipe and measuring the amount of pollution emitted.

The tailpipe test measures carbon monoxide (CO) and volatile organic compound (VOC) emissions. The tailpipe emissions test cannot identify the emissions component that is malfunctioning.

Light duty gasoline fueled vehicles that are model year 1996 or newer receive an On Board Diagnostic II (OBD II, or OBD) emissions test. Most model year 1996 and newer vehicles have an onboard computer system that continually monitors the electronic sensors of the emission control system while the vehicle's engine is running. When a potential problem is detected, a dashboard warning light is illuminated to alert the driver. An OBD system may detect a problem before symptoms such as poor performance, high emissions or poor fuel economy are recognized by the driver. An OBD II emissions test provides a more comprehensive picture of a vehicle's emissions status because it evaluates emissions during everyday operating conditions, whereas a tailpipe test measures emissions only at a particular moment in time. In addition, and unlike the tailpipe test, the OBD system can help pinpoint the component of the emissions system that is malfunctioning.

MOVES uses a compliance factor input to account for I/M program compliance rates, waiver rates, and adjustments needed to account for the fraction of vehicles within a source type that are covered by an I/M program (the last adjustment is referred to as the "regulatory class coverage adjustment"). The compliance factor is entered as a number from 0 to 100 and represents the percentage of vehicles within a source type that actually receive the benefits of an I/M program.

In addition, the compliance factor is further adjusted to account for the fraction of VMT in Mid TN Counties that are attributed to those vehicles subject to an I/M inspection. Not all passenger cars, passenger trucks and light commercial trucks driving on Mid TN's roads are registered in one of the Mid TN Counties subject to emissions testing. This percentage is derived from the Mid TN MPO's TDM, which tracks the origin and destination of each vehicle trip. Those vehicles, and hence, VMT, that begin outside of the area and are not subject to an I/M test are discounted from the overall total. Several Mid TN Counties have heavily used interstates traversing the County; most of these 'pass through' vehicles are not subject to an I/M inspection. Therefore, the above described I/M compliance factor is further adjusted by applying a VMT percentage factor. This VMT percentage further reduces the I/M compliance factor to account for the fraction of VMT accumulated only by those vehicles that are actually subject to an I/M test.

The total compliance factor entered in MOVES is calculated as:

compliance factor = (percent compliance rate x (100 – percent waiver rate) x (regulatory class coverage x (VMT Percentage/100)))/100

Table 10 contains the various factors used in developing the compliance factors for the Mid TN I/M programs.

Table 10. Mid TN I/M Compliance and Waiver Rates, Regulatory Class Coverage, VMT Percentage and Compliance Factors.

County	Source Type ID	Compliance Rate (%)	Waiver Rate (%)	Regulatory Class Coverage (%)	VMT Percentage (%)	Compliance Factor
Davidson	21	98	0	100	89	87
Davidson	31	98	0	100	89	87
Davidson	32	98	0	100	91.8	90
Rutherford	21	95	5	100	83	75
Rutherford	31	95	5	100	83	75
Rutherford	32	95	5	100	99.5	90
Sumner	21	95	5	100	78	70
Sumner	31	95	5	100	78	70
Sumner	32	95	5	100	95.4	86
Williamson	21	95	5	100	82.2	74
Williamson	31	95	5	100	82.2	74
Williamson	32	95	5	100	85.9	78
Wilson	21	95	5	100	68.6	62
Wilson	31	95	5	100	68.6	62
Wilson	32	95	5	100	91.4	82

EPA's OBD II requirements were generally implemented for light duty vehicles beginning in 1996. For those vehicles that have a Gross Vehicle Weight Rate (GVWR) between 8,500 and 14,000 pounds, OBD II was implemented in a phased approach between 2004 and 2007[2]. To avoid applying OBD II benefits in MOVES to vehicles that were not equipped with OBD II, source types 31 and 32 had applied to them a regulatory class adjustment to exclude those in regulatory class 40 (those with a GVWR of 8,501-10,000 lbs.) from OBD II testing between model years (MY) 1996 and 2007. The compliance factors used for these vehicles are shown in Table 11. Currently these regulatory class 40 vehicles with a model year of 1996–2007 receive a tailpipe emissions test if they are not equipped with OBD II. MOVES does not provide for the ability to simultaneously model emissions testing with a tailpipe test, for these vehicles. For the regulatory class 30 vehicles (GVWR less than 8,501pounds) OBD II was applied beginning in 1996. Beginning with model year 2008, all vehicles are subject to an OBD II test, and are modeled as such.

[2] *On-Board Diagnostic (OBD) Regulations and Requirements: Questions and Answers*, US EPA, APA420-F-03-042, December 2003.

Table 11. Mid TN Compliance and Waiver Rates, Regulatory Class Coverage, VMT Percentage and Compliance Factors Used for Model Years 1996-2007 for Source Types 31 and 32.

County	Source Type ID	Compliance Rate (%)	Waiver Rate (%)	Regulatory Class ID	Regulatory Class Coverage (%)	VMT Percentage (%)	Compliance Factor
Davidson	31	98	0	30	98	89	85
Davidson	32	98	0	30	92	91.8	83
Rutherford	31	95	5	30	98	83	73
Rutherford	32	95	5	30	92	99.5	83
Sumner	31	95	5	30	98	78	69
Sumner	32	95	5	30	92	95.4	79
Williamson	31	95	5	30	98	82.2	73
Williamson	32	95	5	30	92	85.9	71
Wilson	31	95	5	30	98	68.6	61
Wilson	32	95	5	30	92	91.4	76

Some fields in the I/M input file, like “endModelYearID” capture specific program design features, like the last model year subject to the I/M program. This allows for certain adjustments to the I/M program be made directly to the input variables in the I/M input file.

3.11 Starts

The starts input is optional, and should only be used if local data is available. If starts are provided, starts must be provided by month, hourdayID, sourcetypeID and vehicle ageID. There is an option to input starts by day, which appears to include total starts by weekday and weekend day, only. It must include starts from all source types. This number would be a direct function of the sourcetype population. MOVES internally generates the number of starts based on the sourcetype population. Local starts information was not available, thus default starts data was used.

3.12 Hoteling

MOVES provides the option to import hoteling hours if the user has local information on total hoteling hours by hour of the day, day type, month and vehicle model year. Since data for this input was not available locally, MOVES default data was used.

4.0 EMISSIONS FROM ONROAD MOBILE SOURCES

Using the inventory approach in MOVES, emissions in tons per year were developed for the five Mid TN Counties in calendar year 2022 for two scenarios: one without an I/M program, and a second with the current I/M program. MOVES output was summarized using a pivot table in Microsoft Excel. Table 12 illustrates the onroad emissions of CO, NOx and VOCs in Mid TN in 2022 without an I/M program, with the

current program in 2022 and the difference between the two. For a more detailed breakdown of emissions of CO, NOx and VOCs by source type and road type, see the Microsoft Excel summary file. All of the input and output files, too extensive to include as tables in this appendix, are included in an associated ‘zip’ file available upon request.

Table 12. Mid TN Five County Onroad Emissions Without I/M, With I/M, and the Difference in Calendar Year 2022.

		Davidson			Rutherford			Sumner			Williamson			Wilson			Mid TN Total		
No I/M Scenario in 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------		
Motorcycle	11	715.62	38.38	113.46	339.34	19.84	56.74	159.99	9.02	35.31	282.03	15.97	46.19	168.91	10.03	28.16	1,665.90	93.23	279.85
Passenger Car	21	16,139.40	772.58	1,015.60	6,302.37	315.16	408.13	2,912.45	159.32	245.07	5,243.17	250.41	349.54	2,876.61	146.49	183.51	33,473.99	1,643.96	2,201.84
Passenger Truck	31	16,296.89	1,102.50	922.24	6,836.58	473.32	383.09	3,222.73	235.81	233.38	5,087.72	320.14	280.42	3,430.44	256.74	198.51	34,874.37	2,388.51	2,017.64
Light Commercial Truck	32	2,840.05	167.95	124.70	1,152.05	69.88	49.80	546.79	34.75	30.65	859.21	51.11	40.06	560.04	34.84	23.76	5,958.15	358.53	268.97
Intercity Bus	41	0.22	0.43	0.03	0.08	0.20	0.01	0.06	0.21	0.01	0.07	0.18	0.01	0.06	0.15	0.01	0.49	1.18	0.08
Transit Bus	42	5.39	1.52	0.21	0.15	0.06	0.01	-	-	-	0.37	0.12	0.02	-	-	-	5.91	1.70	0.23
School Bus	43	13.96	1.26	0.37	5.56	0.82	0.17	4.99	2.62	0.29	5.42	0.74	0.16	4.02	0.59	0.12	33.94	6.03	1.11
Refuse Truck	51	21.39	51.40	3.28	6.37	14.95	0.93	11.19	32.75	1.94	7.52	19.24	1.18	4.20	10.65	0.63	50.67	128.98	7.96
Single Unit Short-haul Truck	52	1,437.80	404.29	73.15	532.03	141.02	26.54	1,071.51	480.66	72.10	428.86	135.78	24.29	329.65	100.38	17.92	3,799.84	1,262.13	213.99
Single Unit Long-haul Truck	53	32.68	36.31	4.42	9.72	10.25	1.26	17.52	23.67	2.60	10.61	12.25	1.44	5.99	6.66	0.79	76.51	89.14	10.52
Motor Home	54	238.55	28.32	12.39	71.73	8.34	3.63	111.61	19.09	5.50	72.03	9.40	3.64	41.19	5.34	2.03	535.11	70.48	27.18
Combination Short-haul Truck	61	267.52	723.98	46.43	106.30	320.16	19.23	35.76	110.55	6.63	76.74	223.16	13.62	51.20	150.19	8.84	537.52	1,528.05	94.75
Combination Long-haul Truck	62	566.02	1,999.49	119.59	234.52	868.55	49.69	68.05	273.66	13.39	151.68	580.90	30.27	151.59	493.15	36.27	1,171.85	4,215.76	249.21
	Total:	38,575.48	5,328.40	2,435.87	15,596.79	2,242.56	999.22	8,162.65	1,382.10	646.87	12,225.42	1,619.41	790.83	7,623.90	1,215.22	500.54	82,184.25	11,787.69	5,373.33
Current I/M Scenario 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------		
Motorcycle	11	715.62	38.38	113.46	339.34	19.84	56.74	159.99	9.02	35.31	282.03	15.97	46.19	168.91	10.03	28.16	1,665.90	93.23	279.85
Passenger Car	21	13,652.74	671.40	872.13	5,478.87	278.46	357.60	2,568.99	143.01	216.64	4,597.91	224.44	308.14	2,565.36	132.54	164.67	28,863.86	1,449.85	1,919.18
Passenger Truck	31	13,636.91	974.40	782.37	5,885.41	423.04	331.72	2,811.23	213.25	203.57	4,437.65	288.88	245.25	3,028.55	234.81	176.18	29,799.75	2,134.39	1,739.09
Light Commercial Truck	32	2,494.73	153.41	109.29	1,016.16	63.56	43.68	485.98	31.81	26.90	779.10	47.60	36.20	498.64	31.86	21.01	5,274.62	328.24	237.09
Intercity Bus	41	0.22	0.43	0.03	0.08	0.20	0.01	0.06	0.21	0.01	0.07	0.18	0.01	0.06	0.15	0.01	0.49	1.18	0.08
Transit Bus	42	5.39	1.52	0.21	0.15	0.06	0.01	-	-	-	0.37	0.12	0.02	-	-	-	5.91	1.70	0.23
School Bus	43	13.96	1.26	0.37	5.56	0.82	0.17	4.99	2.62	0.29	5.42	0.74	0.16	4.02	0.59	0.12	33.94	6.03	1.11
Refuse Truck	51	21.39	51.40	3.28	6.37	14.95	0.93	11.19	32.75	1.94	7.52	19.24	1.18	4.20	10.65	0.63	50.67	128.98	7.96
Single Unit Short-haul Truck	52	1,437.80	404.29	73.15	532.03	141.02	26.54	1,071.51	480.66	72.10	428.86	135.78	24.29	329.65	100.38	17.92	3,799.84	1,262.13	213.99
Single Unit Long-haul Truck	53	32.68	36.31	4.42	9.72	10.25	1.26	17.52	23.67	2.60	10.61	12.25	1.44	5.99	6.66	0.79	76.51	89.14	10.52
Motor Home	54	238.55	28.32	12.39	71.73	8.34	3.63	111.61	19.09	5.50	72.03	9.40	3.64	41.19	5.34	2.03	535.11	70.48	27.18
Combination Short-haul Truck	61	267.52	723.98	46.43	106.30	320.16	19.23	35.76	110.55	6.63	76.74	223.16	13.62	51.20	150.19	8.84	537.52	1,528.05	94.75
Combination Long-haul Truck	62	566.02	1,999.49	119.59	234.52	868.55	49.69	68.05	273.66	13.39	151.68	580.90	30.27	151.59	493.15	36.27	1,171.85	4,215.76	249.21
	Total:	33,083.52	5,084.59	2,137.12	13,686.24	2,149.26	891.20	7,346.88	1,340.29	584.88	10,849.97	1,558.67	710.41	6,849.35	1,176.36	456.63	71,815.97	11,309.17	4,780.23
Difference between I/M and no I/M Scenarios in 2022		**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compound s (VOC)**	**Carbon Monoxide (CO)**	**Oxides of Nitrogen (NOx)**	**Volatile Organic Compounds (VOC)**
Vehicle Type	SourceType	------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------			------- tons/year -------		
Motorcycle	11	(0.00)	-	0.00	0.00	-	-	(0.00)	-	-	-	-	0.00	-	(0.00)	-	(0.00)	(0.00)	0.00
Passenger Car	21	2,486.65	101.18	143.47	823.49	36.70	50.53	343.46	16.31	28.43	645.27	25.97	41.39	311.25	13.95	18.84	4,610.12	194.11	282.66
Passenger Truck	31	2,659.99	128.09	139.87	951.17	50.28	51.37	411.50	22.56	29.81	650.07	31.26	35.17	401.89	21.93	22.32	5,074.62	254.12	278.55
Light Commercial Truck	32	345.32	14.54	15.41	135.89	6.32	6.12	60.81	2.94	3.75	80.11	3.51	3.86	61.41	2.98	2.75	683.53	30.28	31.89
Intercity Bus	41	0.00	0.00	-	0.00	-	0.00	-	(0.00)	(0.00)	-	(0.00)	(0.00)	0.00	-	-	0.00	(0.00)	(0.00)
Transit Bus	42	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00	-	-	-	-	0.00	0.00
School Bus	43	-	(0.00)	(0.00)	-	(0.00)	-	0.00	(0.00)	(0.00)	-	-	-	-	0.00	(0.00)	0.00	(0.00)	(0.00)
Refuse Truck	51	(0.00)	0.00	-	(0.00)	0.00	0.00	(0.00)	-	-	0.00	0.00	-	(0.00)	-	(0.00)	(0.00)	0.00	(0.00)
Single Unit Short-haul Truck	52	-	(0.00)	0.00	0.00	-	0.00	-	(0.00)	(0.00)	0.00	-	(0.00)	(0.00)	0.00	0.00	0.00	(0.00)	(0.00)
Single Unit Long-haul Truck	53	-	-	-	-	(0.00)	(0.00)	(0.00)	-	(0.00)	(0.00)	0.00	0.00	0.00	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Motor Home	54	(0.00)	0.00	0.00	-	-	-	0.00	(0.00)	0.00	(0.00)	(0.00)	0.00	(0.00)	-	0.00	(0.00)	0.00	0.00
Combination Short-haul Truck	61	-	(0.00)	0.00	(0.00)	(0.00)	(0.00)	0.00	(0.00)	-	(0.00)	-	(0.00)	0.00	0.00	0.00	(0.00)	(0.00)	0.00
Combination Long-haul Truck	62	0.00	(0.00)	0.00	0.00	0.00	0.00	-	0.00	-	0.00	-	0.00	-	-	(0.00)	0.00	(0.00)	0.00
	Total:	5,491.96	243.81	298.74	1,910.55	93.30	108.03	815.77	41.81	61.99	1,375.45	60.73	80.43	774.55	38.87	43.91	10,368.28	478.52	593.10

Appendix D

Methodology for Developing Input Datasets for the MOVES Model

Methodology for Developing Input Datasets for the MOVES Model

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Introduction

In April 2004, the U.S. Environmental Protection Agency (EPA) released a new regulatory (computer) model for estimating mobile source emissions called the MOtor Vehicle Emission Simulator (MOVES). This model replaces an earlier one called MOBILE (Mobile Source Emission Factor Model) because the EPA must update its regulatory computer models periodically, as stipulated by the Clean Air Acts.

MOVES is considered to be superior to MOBILE, as it incorporates the most recent advances in the science to better estimate vehicle emissions. More importantly, MOVES has new input data requirements that are not only different but much larger in scope than the data requirements necessary to run the older model. As of March 2, 2013, the EPA requires that MOVES is used for inventory development in State Implementation Plans (SIP) and regional emissions analysis for showing transportation conformity by all states except for California. Currently several versions of the model exist for these purposes: MOVES2010, MOVES2010a, and MOVES2010b. Each version in the series incorporated certain performance enhancements which did not significantly impact any changes on emissions in computer runs at the County or Project Level Scales. However, a newer version of the model (MOVES2014) was released in July 31, 2014 that contains modifications which may impact changes in emissions. Likewise, certain modifications occurred in the format of the MySQL tables that receive the input data between the 2010 and 2014 versions of the model.

On November 4, 2014, EPA released still another version of the model (MOVES2014a) that contains minor revisions to the previously released model (MOVES2014). Since significant changes in criteria pollution emissions did not result, MOVES2014a is not considered to be a new model for SIP and transportation conformity purposes. In the future, MOVES2014 and the minor revisions (currently, only MOVES2014a) will replace MOVES2010 and its minor revisions (MOVES2010a and MOVES2010b) for regulatory purposes. The grace period between using MOVES2010 and MOVES2014 will end on October 7, 2016. Nonetheless, the EPA strongly recommends states use the latest version of MOVES that is available instead of relying on previous versions of the model. The EPA also recommends that states derive input data for the model from local sources. At the moment, adequate data in the appropriate format to run MOVES are not available for many states in the country, and Tennessee is not an exception.

The purpose of this project was to develop several of these new datasets for the State of Tennessee. The input datasets are listed in Table 1. (Note: all tables mentioned in this document are included in Appendix D.1.) These input files will also be formatted to MOVES2014a, which is the most recent version of the model, as of the writing of this document. Thereafter, MOVES2014a will be referred to simply as MOVES.

The CDM (County Data Manager) tab is the dialog box of the importer tool in MOVES; it allows the user to import data into MySQL, which is the data management software package included with the model. Other input datasets, located in the CDM, such as the Average Speed Distribution, Meteorological Data, Fuel, and I/M Programs, will not be discussed in this report; these datasets will be developed by other entities. It is assumed that the reader of this document has some familiarity with using MOVES, so only a minimal discussion of the mechanics of the model will be forthcoming in the following paragraphs. For the interested reader, details concerning MOVES can be found in the EPA documentation on the Internet: http://www.epa.gov/otaq/models/moves/index.htm

Input data (based on the calendar year 2014) were first developed for five counties in Tennessee: Anderson, Blount, Knox, Loudon, and Roane. This region has recently been in non-attainment for two criteria pollutants (ground-level ozone and fine particulate matter), and data were needed as soon as possible by the Tennessee Department of Environment and Conservation (TDEC) to use for modeling transportation conformity analysis. The year 2014 also corresponds to a reporting year for state supplied data to the EPA National Emission Inventory (NEI). Thus, input data developed by this project can also be used to develop mobile source emission inventories using MOVES for the 2014 NEI submission.

Microsoft Excel files will be included with this document to exhibit sample calculations or data manipulation in spreadsheet format for each the five counties mentioned above. Knox County data will discussed independently using formulas or equations to show how the input datasets were developed in a mathematical layout. The Excel files for the five counties will be supplied in a single compressed (zip) file. The input data that are intended for running MOVES will also be supplied in a separate compressed (zip) file containing a total of 95 Excel files (one for each county in Tennessee). These files are named by the county in which the data are intended. The names of zip files will be listed in the Summary section of this document. The

input data will be provided in the appropriate format for use with the CDM importer tool in MOVES. The following methodology will describe the preparation of these input datasets, as well as any quality assurance measures that were taken to ensure the integrity of the data.

Source Type Population

Vehicles in MOVES are categorized into 13 source types: Motorcycle, Passenger Car, Passenger Truck, Light Commercial Truck, Intercity Bus, Transit Bus, School Bus, Refuse Truck, Single Unit Short-haul Truck, Single Unit Long-haul Truck, Motor Home, Combination Short-haul Truck, and Combination Long-haul Truck. The source type population is the actual number of vehicles of each source type in the modeling domain. Vehicles are called source types in MOVES because the model relies more on the activity or use of the vehicles to simulate emissions rather than on engine and/or body style configurations.

Two methods were used to develop the source type populations: the vehicle registration data method and the national default-local data method. The former utilizes statewide motor vehicle registration data or other reliable databases at the state or federal level. This is the preferred EPA procedure when actual road count data are not available. The latter method utilizes the ratio of default population and vehicle miles traveled (VMT) data generated by MOVES, as well as local VMT and vehicle classification data via a calculation procedure. This method is also acceptable by EPA but is used only when motor vehicle registration data are not available and/or inappropriate to use for the source types.

Vehicle Registration Data Method

Motor vehicle registration data were provided by the Tennessee Department of Revenue (TDOR) in the format of a text file. This file contained the vehicles currently registered or scheduled for a license renewal in the state at the time the database query was executed. For the current project, vehicle data were extracted to reflect the end of the calendar year 2014. Each record or row of data in the text file indicated a single motor vehicle. The start- and end-length of each record contains 49 integers and/or spaces; these represented coded or abbreviated information that could be used to identify or clarify source types. Information contained in the record are vehicle identification number (VIN), year, make, model, use, type, body style, fuel, county of registration, and license plate class. Descriptions of the coding were provided by

TDOR for interpretation of the information contained in the text file. Several of the codes, such as use, type, body style, and license class are specific to the state. These codes can change over time as manufacturing adapts to meet changing consumer demand for different body or frame styles and as road tax legislation may alter classifications which are based on gross weight.

Several group discussions were held with TDOR personnel to explain the source type population requirements for MOVES before the motor vehicle data were extracted to the text file. States typically report to the Federal Highway Administration (FHWA) on the operating characteristic of their road systems using Highway Performance Monitoring System (HPMS) classifications, so personnel were somewhat familiar applying these terms. Therefore, the text file contained preliminary MOVES source type and HPMS designations for each record.

Presently, 13 vehicle classes are contained in HPMS, but these should not be confused with the 13 source types used in MOVES. The HPMS classes rely more heavily on frame or body style, number of wheels and/or axles, and gross vehicle weight. The HPMS classes can be reordered into six general categories: Motorcycle, Passenger Car, Other 2-axle 4-tire Vehicles, Buses, Single Unit Trucks, and Combination Trucks. More details of the HPMS format can be found in the FHWA documentation on the Internet:
https://www.fhwa.dot.gov/policyinformation/hpms.cfm

Starting with the 2014 release of the model, the EPA decided that only five subsets of HPMS will be used because of trouble distinguishing between all types of light-duty vehicles using traffic or road tube counters. For this situation, the two HPMS classes (i.e., Passenger Car and Other 2-axle 4-tire Vehicles) were combined into a single class called Light Duty Vehicles. This HPMS (defined by EPA) will include both short and long wheelbases. More will be said later in the paper about this effect on developing the input data for MOVES.

The total number of vehicles in the initial data extraction was 5,513,062. Source types associated with MOVES and the HPMS vehicle categories are listed in Table 2. Heavy-duty freight trucks, utility trailers, and special government vehicles were not included in the extraction. As may be the case, county registered heavy duty vehicles used for hauling freight over short or long distances are not necessarily representative of that portion of the fleet because these vehicles may typically transport freight across state and county borders.

Inspecting the results in the table reveals that the percentages for Passenger Car (HPMS 20 or MOVES 21) and Other 2 axle-4 tire Vehicles (HPMS 30) or Passenger Truck plus Light Commercial Truck (MOVES 32 & 33) are approximately 76% and 16%, respectively. It is believed the number of vehicles initially assigned to Passenger Car in the data extraction were overstated by TDOR. The reason for this is other published data normally show comparable percentages between Passenger Car and Passenger Truck for states that are less urbanized. For example, FHWA highway statistics compiled for Tennessee during 2014 showed about 42% automobiles and 55% trucks. As a second illustration, Polk data for cars and light-duty trucks for the end of the calendar year 2013 showed about 45% cars and 55% light-duty trucks for Tennessee. R.L. Polk & Co. currently operating as IHS Automotive, is a private company that provides automotive information for a fee. The EPA has customarily relied on Polk as one of its sources for quality assurance in developing default vehicle population data for MOVES. For more information on Polk, the Internet site is https://www.ihs.com/btp/polk.html.

The FHWA and Polk data are summarized in Table 3. Several factors may account for the disagreement in the data. For instance, the method in which vehicles were classified and the time period when the data were compiled are not the same across the collection sources. On the other hand, it is believed that further action was needed to transform the state's motor vehicle registration data into results that were more in line with the reported data from FHWA and Polk.

Using a VIN decoder on the Internet and other abbreviated or coded information contained in the text file, such as make, model, type, use, class, body, etc., the vehicles were rearranged into source types by a repetitive trial-and-error procedure using database query software (i.e., Microsoft Access®). The source type population resulting from this activity are shown in Table 4. As can be seen, the percentage for Passenger Car (MOVES 21), Passenger Truck (MOVES 32), and Light Commercial Truck (MOVES 33) are approximately 47%, 41%, and 6%, respectively (or 47% each for cars and light-duty trucks). The data at this stage compares favorably with the FHWA and Polk data.

It should also be noted in the table that the total number of vehicles after redistributing the data were now 5,410,717 because 111,345 vehicles had been removed from the initial data extraction. These vehicles were registered as antique or show cars which were assumed to be driven somewhat rarely on the public roads. It was more difficult to distinguish between buses

(Intercity, Transit, and School Buses), Refuse Truck, and Motor Home with a high level of certainty because these vehicle had similar engine, body, and weight configurations, so other methods were used to develop population data for these source types. In the following paragraphs, the approach is discussed for the two bus source types where other reliable data were available: Transit Bus and School Bus.

Transit Bus

To meet the needs of the public transportation system, the Federal Transit Administration (FTA) maintains a National Transit Database (NTD). Recipients or beneficiaries of grants for public transportation from the FTA are required to submit operating and financial data to the NTD. Among other information, fleet size, vehicle model and year, fuel type, seating and standing capacity, and average mileage per vehicle on a county basis are contained in the database. Data are available at http://www.ntdprogram.gov/ntdprogram/. Statistics from the NTD were used to determine source type population data for Transit Bus. Thus, it was estimated that a total of 827 transit buses, as classified by EPA, were operating in the state during 2014. These buses were found to be operated in just 10 counties of the state.

School Bus

A statistical report is published annually for the public school systems of Tennessee: http://www.tn.gov/assets/entities/education/attachments/asr_1314.pdf. This report contains a record for the school buses that are operated in the state at the county level. From this data source, it was estimated that a total of 8,864 school buses operated throughout all 95 counties of the state during 2014.

National Default-Local Data Method

Local vehicle data were not available for the Single Unit Long-haul Truck and the Combination Short- and Long-haul Trucks. Population data for the Intercity Bus, Refuse Truck, and Motor Home also were not adequately resolved using motor vehicle registration data. In these circumstances, the EPA recommends using other auxiliary methods. For this situation, population data were derived by a ratio computation method using national default data in conjunction with local VMT and statewide vehicle classification summaries.

The ratio factor is the population data for the source type (numerator) by the distance traveled for the road type (denominator). This (activity) data were obtained by running MOVES at the National Scale for the calendar year of interest (2014) on a per county basis. The multiplying factor (numerator) is the local or county VMT data for the vehicle or source type. These data were obtained from the Tennessee Department of Transportation (TDOT) in the form of the annual average daily vehicle miles traveled (DVMT) and the statewide vehicle classification summaries. The DVMT and vehicle summaries for 2014 are shown in Table 5 and Table 6, respectively. Note that the DVMT for rural freeway is zero for all counties because this road classification is not used in Tennessee. Additionally, vehicle class count summaries for Urban Freeways were not compiled for 2014, so data from 2013 were used.

The vehicle and road data for the state are categorized by HPMS, and as mentioned earlier, MOVES does not directly use the HPMS based classifications. Thus, additional preprocessing is required to distribute or map HPMS to MOVES. In HPMS, six (general) functional road classifications exist: Interstate & Freeways, Principal Arterial, Minor Arterial, Major Collector, Minor Collector, and Local, which are further subdivided into Urban and Rural. In MOVES, only four primary road types are used: Rural Restricted, Rural Unrestricted, Urban Restricted, and Urban Unrestricted. A fifth road type is Off-network, but it accounts for locations where the predominant vehicle activity is essentially not conducted on the roadway, such as starting, parking, and idling. Summaries of the mapping scheme between the HPMS and MOVES classifications are shown in Table 7 for both source and road types.

To smooth out yearly fluctuations in the vehicle classification summaries, a five-year average (i.e., years 2010 through 2014) was used. The raw data from these previous years are not shown in this document, however a summary of the data is built-into the Excel files that will demonstrate the sample calculations in spreadsheet format. The name of this spreadsheet is called "5-Year Average". The final averages were adjusted proportionally across the EPA five HPMS vehicle types, so that the sum of the averaged percentages would equal 100%. In several instances, TDOT did not include a road category in the dataset, so data from the next higher category was used if this data were applicable. For example, Rural Minor Collector data were used for Rural Local data because vehicle traffic on a Rural Minor Collector ultimately passes through a Rural Local road.

The general formula that was used to calculate population source type data is Equation 1. It has three parts represented by the symbols A, B, and C. (Note: all equations mentioned are included in the Appendix D.2 of this document.) The "A" expression evaluates local DVMT for the HPMS vehicle type. The MOVES default population to VMT ratio is the "B" expression. The "C" expression (also a ratio) maps the HPMS vehicle type to the MOVES source type. The C value will equal unity (or 1.0) when the HPMS vehicle type is equivalent to the MOVES source type. Currently this is only the case for Motorcycle, otherwise it is equal to a fraction that sums to unity within MOVES source types that were mapped from the HPMS vehicle type. Sample calculations for the Passenger Car and Combination Long-haul Truck using the equations for Knox County data are include in Appendix D.2.

The supplemental Microsoft Excel file that will show all calculations or data manipulations in spreadsheet format for this section using Knox County data is named Sample Calculations for SourceType Populations - Knox 2014.xlsx. This file contains two spreadsheets. The first spreadsheet is called "SourceType Population" which contains several tables that are used to calculate source type population data using the raw data received from TDOT. The second spreadsheet is called "5-Year Average". This spreadsheet demonstrates how the five-year averages were calculated also using raw data received from TDOT. The sample calculations for Knox County data (shown in Appendix D.2 for Passenger Car and Combination Long-haul Truck, mentioned above) will match the sample calculations shown in the Excel spreadsheets for Knox County.

Lastly, the final results from the national default-local data method are shown in Table 8 for the entire state. The data in the table are for comparison purposes only because all source type population data derived by this method were not used for final population data. Source types used from this method will only include, Intercity Bus, Refuse Truck, Single Unit Long-haul Truck, Motor Home, and Combination Short- and Long-haul Trucks.

Final Statewide Dataset

A summary of the final population data that will be used by source types are shown in Table 9. Motorcycle, Passenger Car, Passenger Truck, Light Commercial Truck, Transit Bus, School Bus, and Single Unit Short-haul Truck were derived from motor vehicle registration data

and other datasets. Intercity Bus, Refuse Truck, Single Unit Long-haul Truck, Motor Home, and Combination Short- and Long-haul Trucks were determined using the calculation method. The data were distributed across counties as per county designation in the respective datasets. The final input data for MOVES are included in the compressed (zip) on a per county basis.

Age Distribution

Age distribution is the age fractions of fleet by age and source type. Vehicle ages in MOVES cover a range of 31 years with vehicles 30 years and older grouped together. States were again encouraged by EPA to develop age distributions with local data. In the present study, local population data were available for only seven of the 13 source types using the motor vehicle registration data and/or other valid data sources. Since the motor vehicle registration data received from TDOT was just a snapshot of registrations for the end of the year, population data needed to be adjusted. Case in point: model year 2015 vehicles were removed from the database and model year 2014 vehicles were assigned to the Age 0 category. Where local population were not available to determine the age distributions, the default age distributions for the year 2014 were used instead. These distributions were obtained from the EPA MOVES Internet site. Default age distributions were used for Intercity Bus, Refuse Truck, Single Unit Long-haul Truck, Motor Home, and Combination Short- and Long-haul Trucks. The final input data for MOVES are included in the compressed (zip) on a per county basis.

Road Type Distribution

Road type distribution is the fraction of source type VMT on each of the four road types. Once again, data in this format are not available for Tennessee, so a calculation method was used to convert HPMS road data into MOVES data. The five-year average vehicle summary classifications by road type (2010-2014) and the 2014 DVMT (both mentioned previously as received from TDOT) were used to develop the road type distributions. Note that local data are classified by HPMS, so the mapping scheme shown in Table 7 had to be applied.

Equation 2 is the overall formula that was used to calculate the VMT road type distributions. It has two parts which are represented by the symbols A and B. The "A" expression evaluates local DVMT for the MOVES road types per HPMS vehicle type. The "B" expression is the MOVES road type ratio that distributes the road type fractions across source

types. Sample calculations for the Passenger Car and Combination Long-haul Truck using the equations for Knox County data are include in Appendix D.2. Off-network was assigned a value of zero. It should be noted that the road type VMT fractions are the same for those source types that were mapped from the HPMS vehicle type. For example, Passenger Car, Passenger Truck, and Light Commercial Truck in MOVES were mapped together from Passenger Car, and Other 2-axle 4-tire Vehicles in HPMS, which are now under the EPA term Light Duty Vehicles - Short and Long Wheelbase, and thus, VMT fractions will be the same for these three source types.

The supplemental Microsoft Excel file showing calculations in spreadsheet format for this section using Knox County data is named Sample Calculations for RoadType VMT Distributions - Knox 2014.xlsx. This file contains two spreadsheets. The first spreadsheet is called "SourceType Pop", which contains several tables that are used to calculate source type VMT distribution data using the raw data received from TDOT. The second spreadsheet is called "5-Year Average". It is the same spreadsheet which was mentioned earlier in the discussion of source type population. The sample calculations for Knox County data (shown in Appendix D.2 for Passenger Car and Combination Long-haul Truck, mentioned above) will match the sample calculations shown in the Excel spreadsheets for Knox County. The final input data for MOVES are included in the compressed (zip) on a per county basis.

Vehicle Type VMT

Annual VMT by the HPMS vehicle classes are required by MOVES. Vehicle type VMT is the total annual or daily VMT by HPMS vehicle type or source type. It includes month, day, and hour VMT fractions. Month VMT fractions are the fraction of annual VMT (per source type) occurring per month. Day VMT fractions are the fraction of monthly VMT (per source type) occurring on one of the two day types (weekday or weekend-day). Hour VMT fractions are the fraction of daily VMT (per source type) occurring per hour.

Once again, the vehicle type VMT data in this format are not available for Tennessee. However, to help the user develop inputs for MOVES, the EPA created several Microsoft Excel spreadsheet-based converter or calculator tools. A modified version of the file named "aadvmtcalculator_hpms.xls" was used to develop the data for vehicle type VMT. First, some

general information will be given about the original EPA file which can be downloaded from the MOVES Internet site listed earlier in the report.

The EPA tool uses annual average weekday (AAD) VMT at the HPMS level to calculate type of day, monthly and yearly VMT in terms of HPMS and/or MOVES source types. The tool contains default vehicle type VMT datasets for monthly, daily, and hourly VMT fractions and provides default monthly and weekend-day adjustment factors if local inputs are not available. However, the decision was made to modify the EPA converter tool after some discussion among stakeholders. The primary concern was that the annual VMT (i.e., the MOVES input for the HPMSBaseYearVMT as calculated via the tool) should equal 365 times the HPMS DVMT data (or 366 if the year for the model run was a leap year).

It is assumed this tool was designed to handle average annual weekday VMT (AAWDVMT) rather than average annual daily traffic (AADVMT). Raw HPMS data from TDOT are reported in terms of AADVMT and by definition represents an average day regardless of weekday or weekend. For their roads analysis, TDOT will normally apply a daily variation factors to represent traffic for a particular weekday or weekend-day. Thus, the EPA tool was modified to essentially multiply daily VMT by 365 (because 2014 was not a leap year) to create the HPMSVTypeYear data. Also since TDOT determines seven-day adjustment factors by months of the year, the weekday and weekend-day adjustment factors could be determined separately. These factors were also added to the modified EPA calculator tool which originally included only default monthly and weekend-day adjustment factors.

A copy of the TDOT five year seasonal variation factors that were used for 2014 are shown in Table 10. Note that the final factors used in the modified tool will be the inverse of the variation factors shown in the table. They are listed for Rural Interstate, Rural Other, Urban, and Recreational. This required preprocessing of the road categories into HPMS road types and averaging the results before the adjustment factors could be applied to the modified EPA calculator tool. The averaging pattern is represented in the Excel file showing the AADVMT sample calculations. It should be noted that the variation factors for Recreational were not used because they are for road traffic in state parks. In effect, weighting factors were created from the road categories that had been mapped to HPMS road types, and then these weighting factors were applied to the averaged adjustment factors to create monthly, weekday, and weekend-day

factors for use in the modified calculator tool. The method of averaging these seasonal variation factors are shown in the Microsoft Excel preprocessing data file mentioned below. One final comment is in order: as of the writing of this document, the EPA has a new converter tool that permits entering ADDVMT data as average day or as an average weekday. This file is called "aadvmt-converter-tool-moves2014.xlsx", but it was decided to say with the original EPA tool because the modified version includes the monthly, weekday and weekend-day adjustment factors.

Once more, it was necessary that local data be preprocessed before it could be used. The general formula that was applied to prepare AADVMT data is Equation 3. Note that this formula is identical to the "A" expression of Equation 1. (It was listed again only to maintain continuity in the narrative.) Sample calculations for the Passenger Car and Combination Long-haul Truck using the equation for Knox County data are include in Appendix D.2.

Two Microsoft Excel file will accompany this section. The names of these files are Sample Calculations for AADVMT - Knox 2014.xlsx and Sample Modified AADVMT Calculator HPMS - Knox 2014.xlsx. The former file includes calculations in spreadsheet format for Knox County that were used to develop the AADVMT input data for the calculation tool. This file contains three spreadsheets. The first spreadsheet is called "AADVMT" which contains several tables that are used to calculate the AADVMT data. The second spreadsheet is called "Adjustment Factors" which contains several tables that are used to calculate the monthly, weekday, and weekend-day adjustment factors. Both of these spreadsheets use raw data received from TDOT. The third spreadsheet is called "5-Year Average". Calculation in this spreadsheet demonstrates how the five-year averages were calculated, using the yearly vehicle summaries by the functional road classes. It is the same spreadsheet that was mentioned earlier in the discussion of source type population and road type distribution. The Sample calculations for Knox County data (shown in Appendix D.2 for Passenger Car and Combination Long-haul Truck, mentioned above) will match the sample calculations shown in the Excel spreadsheets for Knox County.

The latter file is the modified EPA calculator tool that was run using the Knox County AADVMT data. This file contains eight spreadsheets. The main spreadsheet is called "Import HPMS AADVMT and Factors". This spreadsheet accepts the AADVMT and adjustment factor

data generated by the former file (previously discussed). Calculations are shown in the spreadsheet called "Intermediate Calculations". The final calculations become the input data for MOVES which are shown in the three spreadsheets named: "HPMSVTypeYear", "monthVMTFraction-calculated", and "dayVMTFraction-calculated". For closure, the EPA default VMT fractions were included in the file as the following spreadsheets: "monthVMTFraction-default", "dayVMTFraction-default", and "hourVMTFraction-default". The modified tool will only generate the HPMS base year VMT data and the monthly and daily VMT fractions required by MOVES. Therefore, the default hourly VMT fractions are used as input data for MOVES because, at the moment, no hourly vehicle data are available at the local level to aid in calculating hourly fractions. The other two default VMT fractions (month and day) were included for comparison purposes. The final input data for MOVES are included in the compressed (zip) on a per county basis.

Summary

Two compressed (or zip type) files are included with this document. The file named MOVES Input Data files for 2014.zip contains the Excel input data files for the 95 counties of Tennessee. Each file contains eight spreadsheets; seven spreadsheets contain the input data listed in Table 1, and the last spreadsheet contains general comments about the input data. The prefix of the file name is the county name. For example, Knox Input File 2014.xlxs is the Excel file containing MOVES input data for Knox County. The second zip or compressed file contains the Excel files that demonstrate all sample calculations in spreadsheet format for Anderson, Blount, Knox, Loudon, and Roane Counties. The name of this file is Sample Calculations for Five Counties 2014.zip; it contains a total of 20 files, i.e., four sets of sample calculation files per county. Only the files for Knox County were mentioned in this document. However, the naming convention for the files is similar for the other four counties.

Conclusions

Two areas need improvement to enhance the quality of the input data: the motor vehicle registration database and the statewide vehicle classification summaries. A trial-and-error method was required to match vehicles with the MOVES and/or HPMS categories using motor vehicle registration data to generate source type population data. This method is time consuming

and may produce inconsistent results because many of the vehicle categories listed in the registration database are labeled incorrectly and often require a judgment call. For example, vehicle type, use, and body codes exist for commercial bus, school bus, motor home, pick-up truck, and garbage truck in the database, but in many instances, these abbreviations do not match the information derived by querying the VIN. Additional evidence for this problem is shown by the initial data extraction which disclosed almost 80% passenger cars. This is not an attempt to fault TDOR because the purpose of vehicle registration is to collect title information, such as for the establishment of legal ownership of property and to collect road-use taxes, which in turn help finance the construction and/or maintenance of the public roadways. This is to say, the intent of motor vehicle registration data is not to serve as input for the MOVES model.

The final concern involves using statewide data to predict local (county) conditions. The EPA requires that states develop local data for MOVES. Although the quality of data received from TDOT is very high, much of the data have been abridged to generate statewide summaries. In this project, the abridged data were used in various calculation methods to predict local conditions that possibly do not represent the true local condition. The most reliable data are from physical traffic volume counts, which are actual counts of vehicles along a particular road way. However at present, it is very difficult to classify vehicles or distinguish between source types using pneumatic and/or electronic counters. Also the method would be costly and time consuming to perform on all roadways. Therefore, sampling is typically performed on certain roadways on a seasonal basis, and the data are projected to similar locations (i.e., as statewide summaries). Inputs to MOVES require highly detailed data. Concluding: state and local agencies must use computer models for SIPs and transportation conformity analyses. Ultimately the results from these computer programs will influence policy decisions that can have significant economic effects on the community in which they are applied. Therefore, it is paramount that the highest quality of data is used to run the models.

References

1. U.S. Environmental Protection Agency. *Motor Vehicle Emission Simulator (MOVES): User Guide for MOVES2014a*. Assessment and Standards Division, Office of Transportation and Air Quality; EPA-420-B-15-095; November 2015.

2. U.S. Environmental Protection Agency. *MOVES2014 and MOVES2014a Technical Guidance: Using MOVES to Prepare Emission Inventories in State Implementation Plans and Transportation Conformity.* Assessment and Standards Division, Office of Transportation and Air Quality; EPA-420-R-15-093; November 2015.

3. U.S. Environmental Protection Agency. *Population and Activity of On-road Vehicles in MOVES2014.* Assessment and Standards Division, Office of Transportation and Air Quality; EPA-420-R-16-003a; March 2016.

4. U.S. Department of Transportation. *Highway Performance Monitoring System – Field Manual*. Federal Highway Administration (FHWA); Office of Highway Policy Information; Office of Management & Budget (OMB) Control No. 2125-0028; March 2014.

5. U.S. Department of Transportation. *Traffic Monitoring Guide*. Federal Highway Administration (FHWA); Office of Highway Policy Information; September 2013.

Appendix D.1: Tables

Appendix D.2: Equations & Sample Calculations

Appendix D.1
Tables

Table 1: Input Data Files

CDM (tab) Name	Data Source (file) Name
Source Type Population	sourceTypeYear
Age Distribution	sourceTypeAgeDistribution
Road Type Distribution	roadTypeDistribution
Vehicle Type VMT	HPMSVTypeYear
	monthVMTFraction
	dayVMTFraction
	hourVMTFraction

Table 2: Number of Vehicles in the TDOR Initial Data Extraction

HPMS ID	HPMS Vehicle Type	TDOR Extraction	MOVES ID	MOVES Source Type	TDOR Extraction
10	Motorcycle	158,643	11	Motorcycle	158,643
20	Passenger Car	4,215,201	21	Passenger Car	4,215,201
30	Other 2 axle-4 tire Vehicles	872,451	31	Passenger Truck	872,247
			32	Light Commercial Truck	204
40	Buses	3,261	41	Intercity Bus	772
			42	Transit Bus	1,459
			43	School Bus	1,030
50	Single Unit Trucks	263,506	51	Refuse Truck	326
			52	Single Unit Short-haul Truck	256,030
			53	Single Unit Long-haul Truck	na
			54	Motor Home	7,150
60	Combination Trucks	na	61	Combination Short-haul Truck	na
			62	Combination Long-haul Truck	na
	Total	**5,513,062**		**Total**	**5,513,062**

Note: vehicle data from HPMS ID 20 & 30 will be combined, assigned ID 25, and called Light Duty Vehicles - Short and Long Wheelbase for evaluation in MOVES; na = not available

Table 3: FHWA and Polk Vehicle Registration Data for Tennessee

Source	Vehicle Type	Private and Commercial	Publicly Owned	Total
FHWA (2014)	Motorcycles	162,396	2,314	**164,710**
	Automobiles *	2,236,150	37,362	**2,273,512**
	Trucks	2,945,617	85,779	**3,031,396**
	Buses	2,069	23,960	**26,029**
	Total	**5,346,232**	**149,415**	**5,495,647**
Polk **	Cars	-		2,456,340
	Light-duty Trucks	-		3,062,978
	Total	-		**5,519,318**

*** Including Taxicabs; Source: FHWA Highway Statistics; State Motor-Vehicle Registrations, abridged Table MV-1; ** Polk car and light-duty truck registration database; condensed data for end of year 2013.**

Table 4: Number of Vehicles after Redistribution of Data

MOVES ID	MOVES sourceTypeName	TDOR Extraction
11	Motorcycle	158,643
21	Passenger Car	2,565,518
31	Passenger Truck	2,209,403
32	Light Commercial Truck	327,352
41	Intercity Bus	892
42	Transit Bus	1,459
43	School Bus	3,105
51	Refuse Truck	326
52	Single Unit Short-haul Truck	118,362
53	Single Unit Long-haul Truck	na
54	Motor Home	16,657
61	Combination Short-haul Truck	na
62	Combination Long-haul Truck	na
	Total	**5,401,717**

Note: total reflects 111,345 antique vehicles removed from initial TDOT data extraction

Table 5: HPMS 2014 DVMT Rural and Urban

Reg	Co #	County	Interstate		Freeways		Principal Arterial		Minor Arterial		Major Collector	Major Collector	Minor Collector	Minor Collector	Local		County Total
			Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Urban	Rural	Rural	Urban	
1	1	ANDERSON	504,792	0	0	0	32,921	665,757	0	303,626	171,309	153,153	31,696	64,809	69,801	311,192	2,309,056
3	2	BEDFORD	17,519	0	0	0	204,120	223,371	160,467	64,756	111,747	31,894	0	99,898	99,624	67,392	1,080,788
4	3	BENTON	260,616	0	0	0	130,096	0	64,282	0	89,868	0	0	45,880	39,902	0	630,644
2	4	BLEDSOE	0	0	0	0	124,352	0	38,423	0	24,279	0	0	46,467	42,601	0	276,122
1	5	BLOUNT	0	89,422	0	27,928	195,499	1,016,348	84,877	464,579	19,685	368,747	43,606	65,741	136,140	564,908	3,077,480
2	6	BRADLEY	154,368	809,944	0	148,857	0	566,353	34,650	480,515	62,492	178,797	50,618	33,423	56,380	635,809	3,212,206
1	7	CAMPBELL	936,417	0	0	0	158,482	150,132	36,338	8,627	112,700	11,292	0	120,861	125,609	21,348	1,681,806
2	8	CANNON	0	0	0	0	118,413	0	76,107	0	32,652	0	0	43,052	35,879	0	306,103
4	9	CARROLL	19,906	0	0	0	204,487	57,072	180,738	16,590	98,515	14,074	723	59,773	59,481	22,686	734,045
1	10	CARTER	0	52,240	0	0	61,288	325,137	112,559	190,917	55,508	93,643	523	26,905	42,189	118,477	1,079,386
3	11	CHEATHAM	549,278	0	0	0	0	0	331,153	0	170,875	0	0	99,633	113,293	0	1,264,232
4	12	CHESTER	0	0	0	0	44,321	69,746	84,706	16,051	38,240	35,892	0	36,620	34,637	28,893	389,106
1	13	CLAIBORNE	0	0	0	0	372,091	0	144,582	0	34,545	0	0	96,649	94,812	0	742,679
2	14	CLAY	0	0	0	0	65,118	0	42,841	0	11,085	0	0	18,070	28,620	0	165,734
1	15	COCKE	316,413	243,209	0	0	0	150,315	211,345	69,928	46,635	11,122	13,235	62,170	82,996	46,068	1,253,436
2	16	COFFEE	803,585	372,455	0	0	72,086	310,820	29,899	230,497	115,929	88,144	16,674	116,564	97,939	203,835	2,458,427
4	17	CROCKETT	0	0	0	0	260,321	0	41,500	0	115,916	0	0	45,980	35,336	0	499,053
2	18	CUMBERLAND	876,509	233,563	0	0	106,921	160,240	90,305	119,736	184,682	143,217	7,171	75,725	114,813	369,848	2,482,730
3	19	DAVIDSON	711,778	8,995,052	0	1,630,206	149,716	3,284,898	412,949	3,019,604	63,731	903,094	0	104,161	121,768	3,201,874	22,598,831
4	20	DECATUR	171,268	0	0	0	167,322	0	20,066	0	38,751	0	0	30,363	31,330	0	459,100
2	21	DE KALB	0	0	0	0	0	0	282,995	0	58,722	0	0	47,314	73,048	0	462,079
3	22	DICKSON	612,227	30,011	0	0	58,531	227,988	398,200	48,804	117,494	48,895	0	82,982	102,020	56,285	1,783,437
4	23	DYER	122,297	52,973	0	25,772	151,023	276,408	31,742	105,606	80,447	104,513	28,911	60,020	47,542	151,971	1,239,225
4	24	FAYETTE	495,162	0	0	0	282,527	241,304	234,960	35,621	117,271	37,380	0	82,815	79,483	72,684	1,679,207
2	25	FENTRESS	0	0	0	0	160,493	0	90,684	0	43,266	0	0	77,360	116,143	0	487,946
2	26	FRANKLIN	0	0	0	0	167,002	178,923	59,590	89,028	147,681	31,969	8,009	61,977	85,926	78,925	909,030
4	27	GIBSON	0	0	0	0	222,740	219,331	160,971	46,891	175,775	22,153	2,659	106,709	92,578	40,875	1,090,682
3	28	GILES	370,353	0	0	0	134,417	66,787	192,808	72,655	89,271	11,085	5,970	87,352	80,595	21,957	1,133,250
1	29	GRAINGER	0	0	0	0	232,710	0	156,822	0	70,883	0	0	58,857	71,663	0	590,935
1	30	GREENE	864,019	0	0	0	105,693	478,259	155,392	140,174	142,195	64,819	42,193	159,383	156,851	174,734	2,483,712
2	31	GRUNDY	258,186	0	0	0	370	0	126,547	0	75,918	0	0	13,191	34,071	0	508,283
1	32	HAMBLEN	275,070	29,650	0	0	482	657,804	0	234,516	58,260	139,758	24,488	37,147	49,081	256,076	1,762,332
2	33	HAMILTON	0	2,768,873	0	1,156,147	167,270	2,041,882	61,099	2,024,321	10,885	404,106	85,908	64,500	63,678	1,352,142	10,200,811
1	34	HANCOCK	0	0	0	0	0	0	56,752	0	15,264	0	0	13,395	14,060	0	99,471
4	35	HARDEMAN	0	0	0	0	149,631	89,822	181,901	12,168	29,185	5,802	1,445	78,837	56,395	13,290	618,476
4	36	HARDIN	0	0	0	0	90,548	120,040	190,064	55,511	41,315	39,825	3,044	48,312	51,958	65,535	706,152

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Reg	Co #	County	Interstate		Freeways		Principal Arterial		Minor Arterial		Major Collector	Major Collector	Minor Collector	Minor Collector	Local		County Total
			Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Urban	Rural	Rural	Urban	
1	37	HAWKINS	0	0	0	0	305,562	224,039	148,060	53,996	74,135	34,565	0	95,704	145,357	53,830	1,135,248
4	38	HAYWOOD	716,706	24,212	0	0	0	62,841	129,209	48,675	93,641	14,852	1,397	36,959	35,715	26,562	1,190,769
4	39	HENDERSON	732,888	0	0	0	149,401	164,372	104,969	20,887	73,763	22,845	1,546	47,240	54,239	50,049	1,422,199
4	40	HENRY	0	0	0	0	269,990	164,767	26,788	35,007	130,920	33,861	7,224	44,727	68,934	56,381	838,599
3	41	HICKMAN	479,774	0	0	0	15,415	0	309,160	0	66,709	0	0	63,062	70,101	0	1,004,221
3	42	HOUSTON	0	0	0	0	0	0	82,132	0	36,556	0	0	14,229	19,192	0	152,109
3	43	HUMPHREYS	439,010	0	0	0	0	0	284,417	0	20,702	0	0	93,977	60,131	0	898,237
2	44	JACKSON	0	0	0	0	0	0	133,053	0	42,503	0	0	24,970	30,126	0	230,652
1	45	JEFFERSON	1,253,496	23,315	0	0	0	168,883	307,213	83,700	199,362	18,529	10,183	101,715	125,253	40,471	2,332,120
1	46	JOHNSON	0	0	0	0	3,870	0	172,061	0	87,534	0	0	27,890	40,688	0	332,043
1	47	KNOX	498,500	5,194,493	0	58,604	0	2,662,076	81,947	2,278,761	87,171	810,233	51,429	114,023	117,858	2,815,096	14,770,191
4	48	LAKE	0	0	0	0	0	0	60,434	0	11,334	0	0	12,888	9,013	0	93,669
4	49	LAUDERDALE	0	0	0	0	166,417	114,980	10,090	41,393	87,404	17,655	376	50,870	52,333	23,290	564,808
3	50	LAWRENCE	0	0	0	0	325,996	156,709	20,453	76,530	118,226	18,279	0	115,445	156,300	34,869	1,022,807
3	51	LEWIS	0	0	0	0	84,594	0	65,341	0	9,021	0	0	16,146	18,407	0	193,509
3	52	LINCOLN	0	0	0	0	197,497	267,687	38,929	20,685	113,124	33,467	26,522	81,463	83,134	82,155	944,663
1	53	LOUDON	425,354	712,839	0	0	123,144	236,222	56,845	131,482	34,913	165,584	33,335	75,017	53,020	320,137	2,367,892
2	54	MC MINN	837,204	151,234	0	0	101,467	157,408	225,975	153,961	113,649	83,512	9,771	101,864	121,978	129,272	2,187,295
4	55	MC NAIRY	0	0	0	0	406,230	0	102,677	0	84,588	0	0	86,528	68,751	0	748,774
3	56	MACON	0	0	0	0	184,109	0	41,257	0	84,372	0	0	67,349	62,739	0	439,826
4	57	MADISON	544,216	506,818	0	0	383,706	738,649	54,744	491,513	85,554	238,401	18,537	121,011	81,284	428,274	3,692,707
2	58	MARION	1,294,143	0	0	0	178,499	0	82,272	0	238,016	0	0	60,339	72,999	0	1,926,268
3	59	MARSHALL	252,895	19,336	0	0	0	88,326	268,779	76,839	81,858	22,511	965	44,998	62,799	41,997	961,303
3	60	MAURY	464,675	36,701	0	209,080	294,858	602,808	224,917	162,054	146,204	125,251	0	122,944	105,358	219,575	2,714,425
2	61	MEIGS	0	0	0	0	29,817	0	186,098	0	34,279	0	0	32,802	40,659	0	323,655
1	62	MONROE	190,318	73,365	0	0	215,739	70,298	262,859	34,931	77,723	15,432	9,085	135,025	169,279	30,833	1,284,887
3	63	MONTGOMERY	254,951	529,693	0	0	76,428	1,032,011	233,009	897,830	106,245	215,084	850	111,703	156,820	588,553	4,203,177
3	64	MOORE	0	0	0	0	88,696	941	0	0	21,465	0	0	29,711	25,231	0	166,044
1	65	MORGAN	0	0	0	0	96,554	0	121,897	1,517	35,093	0	60	65,377	51,096	0	371,594
4	66	OBION	0	0	0	0	313,108	135,283	92,458	38,597	106,131	25,015	464	69,626	75,268	28,356	884,306
2	67	OVERTON	0	0	0	0	270,705	0	97,441	0	60,613	0	0	53,661	69,623	0	552,043
3	68	PERRY	0	0	0	0	61,263	0	76,498	0	20,351	0	0	24,310	28,502	0	210,924
2	69	PICKETT	0	0	0	0	69,264	0	1,605	0	16,183	0	0	13,629	19,987	0	120,668
2	70	POLK	0	0	0	0	300,732	0	34,526	0	21,917	0	0	50,272	88,310	0	495,757
2	71	PUTNAM	1,111,229	533,278	0	146,551	10,977	267,623	76,594	301,189	107,924	129,866	51,563	74,207	101,076	372,023	3,284,100
2	72	RHEA	0	0	0	0	217,995	185,123	127,254	58,543	28,684	24,406	16,944	50,989	57,209	49,717	816,864

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Reg	Co #	County	Interstate		Freeways		Principal Arterial		Minor Arterial		Major Collector	Major Collector	Minor Collector	Minor Collector	Local		County Total
			Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Rural	Urban	Urban	Rural	Rural	Urban	
1	73	ROANE	258,148	595,334	0	0	58,862	338,293	61,713	184,610	58,359	29,439	43,383	54,854	55,823	123,163	1,861,981
3	74	ROBERTSON	1,225,565	149,162	0	0	4,337	272,330	280,103	61,118	192,339	90,800	0	105,985	125,753	133,035	2,640,527
3	75	RUTHERFORD	233,113	2,324,945	0	257,255	597,556	1,302,462	144,330	1,337,504	228,074	647,124	0	124,469	145,092	1,413,584	8,755,508
1	76	SCOTT	0	0	0	0	182,332	0	90,405	0	52,565	0	0	50,579	71,628	0	447,509
2	77	SEQUATCHIE	0	0	0	0	267,409	0	3,399	149	44,936	0	0	35,590	47,050	0	398,533
1	78	SEVIER	0	309,868	0	0	231,153	989,100	425,109	266,983	142,182	258,441	35,947	119,357	416,818	587,979	3,782,937
4	79	SHELBY	111,617	5,820,404	0	1,437,471	304,233	5,332,115	197,829	5,928,365	15,308	1,508,953	6,233	158,652	140,709	3,471,543	24,433,432
3	80	SMITH	648,175	0	0	0	0	0	221,134	0	62,314	0	0	45,535	38,451	0	1,015,609
3	81	STEWART	0	0	0	0	183,794	0	41,632	0	44,027	0	0	28,167	52,424	0	350,044
1	82	SULLIVAN	57,023	932,670	0	164,912	84,717	1,157,609	27,410	815,503	56,096	205,736	12,887	50,073	107,360	509,517	4,181,513
3	83	SUMNER	0	362,619	0	607,853	292,113	738,958	253,753	319,005	142,932	452,716	0	109,926	151,327	750,767	4,181,969
4	84	TIPTON	0	0	0	0	111,242	330,349	101,046	102,462	84,199	28,981	2,150	120,222	128,021	69,296	1,077,968
3	85	TROUSDALE	0	0	0	0	60,541	0	97,620	0	23,459	0	0	19,595	18,021	0	219,236
1	86	UNICOI	133,805	213,619	0	0	0	0	1,895	68,837	45,983	36,999	3,594	13,249	11,511	72,194	601,686
1	87	UNION	0	0	0	0	0	0	142,415	0	89,821	0	0	38,505	58,204	0	328,945
2	88	VAN BUREN	0	0	0	0	81,472	0	24,781	0	18,231	0	0	22,228	19,605	0	166,317
2	89	WARREN	0	0	0	39,344	179,280	166,710	74,835	94,636	86,694	24,317	4,765	60,483	69,625	52,545	853,234
1	90	WASHINGTON	171,539	634,639	0	0	115,673	512,688	145,535	688,479	76,928	182,783	16,649	78,607	90,719	383,398	3,097,637
3	91	WAYNE	0	0	0	0	82,823	0	102,142	0	47,849	0	0	50,950	52,582	0	336,346
4	92	WEAKLY	0	0	0	0	249,445	104,523	31,554	64,386	162,684	13,745	618	62,391	74,274	37,573	801,193
2	93	WHITE	0	0	0	0	91,428	198,000	81,984	47,533	42,432	27,957	14,949	53,372	44,462	61,781	663,898
3	94	WILLIAMSON	639,041	1,413,470	0	0	777,749	717,750	517,500	555,295	193,017	477,084	0	313,435	263,302	1,028,484	6,896,127
3	95	WILSON	424,271	1,158,077	0	34,687	372,969	565,233	283,792	376,496	170,114	210,532	0	195,259	126,605	301,660	4,219,695
STATE TOTALS			21,717,419	35,397,483	0	5,944,667	13,662,152	31,805,903	12,272,191	23,770,172	7,711,386	9,188,329	748,299	6,617,048	7,546,377	22,264,763	198,646,189
HPMS AREAWIDE DVMT			21,717	35,397	0	5,945	13,662	31,806	12,272	23,770	7,711	9,188	748	6,617	7,546	22,265	198,646

Table 6: Class Count 2014 Summary for the Rural and Urban Road System

Functional Class	(1) RURAL INTERSTATE	(2) RURAL PRINCIPAL ARTERIAL	(6) RURAL MINOR ARTERIA	(7) RURAL MAJOR COLLECTO	(8) RURAL MINOR COLLECTOR	(11) URBAN INTERSTATE	(12) URBAN FREEWAY	(14) URBAN PRINCIPAL ARTERIAL	(16) URBAN MINOR ARTERIAL	(17) URBAN COLLECTOR
Motorcycles (1)	**0.68%**	**0.79%**	**0.63%**	**0.62%**	**0.58%**		**0.18%**	**0.53%**	**0.66%**	**0.45%**
Cars (2)	52.78%	65.04%	68.34%	68.66%	70.85%		74.25%	74.29%	74.19%	77.18%
Pick-ups, Panels & Vans (3)	14.51%	24.64%	25.33%	27.01%	25.87%		19.14%	20.42%	20.36%	20.66%
Passenger Vehicles (2+3)	**67.29%**	**89.68%**	**93.68%**	**95.67%**	**96.72%**		**93.39%**	**94.71%**	**94.55%**	**97.84%**
Buses (4)	**0.24%**	**0.05%**	**0.03%**	**0.02%**	**0.01%**		**0.19%**	**0.02%**	**0.02%**	**0.02%**
Dual Rear Trucks (5)	1.22%	1.08%	0.91%	0.84%	0.81%		1.01%	0.70%	0.70%	0.65%
3-Axle Trucks (6)	0.80%	0.99%	0.82%	0.76%	0.64%		0.51%	0.58%	0.67%	0.33%
4-Axle Trucks (7)	0.36%	0.33%	0.20%	0.20%	0.18%		0.06%	0.34%	0.38%	0.07%
Sinle Unit Trucks (5+6+7)	**2.38%**	**2.41%**	**1.93%**	**1.80%**	**1.62%**		**1.58%**	**1.63%**	**1.75%**	**1.05%**
2S-1, 3S-1, 2S-2 (8)	2.06%	1.29%	0.78%	0.62%	0.47%		1.35%	1.00%	1.15%	0.39%
3S-2, 2S-3 (9)	23.70%	4.38%	2.66%	0.98%	0.52%		2.79%	1.01%	0.56%	0.10%
3S-3, 3S-4 (10)	0.48%	0.42%	0.07%	0.05%	0.01%		0.06%	0.11%	0.09%	0.02%
Tractor Trailer Trucks (8+9+10)	**26.24%**	**6.09%**	**3.51%**	**1.65%**	**1.00%**		**4.21%**	**2.12%**	**1.80%**	**0.51%**
2S-1-2 (11)	1.88%	0.44%	0.07%	0.12%	0.03%		0.28%	0.39%	0.48%	0.07%
2S-2-2, 3S-1-2 (12)	0.87%	0.10%	0.04%	0.04%	0.01%		0.11%	0.20%	0.26%	0.01%
Any 7 Axle (13)	0.42%	0.43%	0.11%	0.08%	0.03%		0.06%	0.40%	0.48%	0.05%
Multi-Trailer Trucks (11+12+13)	**3.17%**	**0.97%**	**0.22%**	**0.23%**	**0.07%**		**0.45%**	**0.99%**	**1.22%**	**0.13%**
Combination Trucks	**29.41%**	**7.06%**	**3.73%**	**1.89%**	**1.07%**		**4.65%**	**3.11%**	**3.02%**	**0.64%**
	100.00%	**100.00%**	**100.00%**	**100.00%**	**100.00%**		**100.00%**	**100.00%**	**100.00%**	**100.00%**

Table 7: HPMS and MOVES Mapping Scheme

Item	HPMS	MOVES
Vehicle Class (Source Type)	Motorcycle	Motorcycle
	Light Duty Vehicles - Short and Long Wheelbases *	Passenger Car
		Passenger Truck
		Light Commercial Truck
	Buses	Intercity Bus
		Transit Bus
		School Bus
	Single Unit Trucks	Refuse Truck
		Single Unit Short-haul Truck
		Single Unit Long-haul Truck
		Motor Home
	Combination Trucks	Combination Short-haul Truck
		Combination Long-haul Truck
Functional Road System (Road Type)	Rural Interstate & Freeway	Rural Restricted
	Rural Principal Arterial	Rural Unrestricted
	Rural Minor Arterial	
	Rural Major Collector	
	Rural Minor Collector	
	Rural Local	
	Urban Interstate & Freeway	Urban Restricted
	Urban Principal Arterial	Urban Unrestricted
	Urban Minor Arterial	
	Urban Major Collector	
	Urban Minor Collector	
	Urban Local	

*** HPMS includes Passenger Cars and Other 2 axle-4 Tire Vehicles**

Table 8: Population Data from National Default-Local Data Method

MOVES SourceType	Population	% of Total
Motorcycle *	229,501	3.7
Passenger Car *	3,080,076	50.2
Passenger Truck *	2,098,594	34.2
Light Commercial Truck *	523,749	8.5
Intercity Bus	83	0.001
Transit Bus *	308	0.005
School Bus *	2,761	0.04
Refuse Truck	2,714	0.04
Single Unit Short-haul Truck *	89,535	1.5
Single Unit Long-haul Truck	3,766	0.06
Motor Home	22,420	0.37
Combination Short-haul Truck	41,938	0.68
Combination Long-haul Truck	46,098	0.75
Total	**6,141,544**	**100**

*** Source Types not used in final database using this method**

Table 9: Final Statewide Population Data

MOVES Source Type	Population	% of Total
Motorcycle	157,540	2.9
Passenger Car	2,530,079	46.6
Passenger Truck	2,182,324	40.2
Light Commercial Truck	319,672	5.9
Intercity Bus	83	0.002
Transit Bus	827	0.02
School Bus	8,864	0.16
Refuse Truck	2,714	0.05
Single Unit Short-haul Truck	111,493	2.1
Single Unit Long-haul Truck	3,766	0.07
Motor Home	22,420	0.41
Combination Short-haul Truck	41,938	0.77
Combination Long-haul Truck	46,098	0.85
Total	**5,427,818**	**100**

Table 10: 5-Year Average Monthly Variation Factors, by Day of Week for 2014

2014	JAN.	FEB.	MAR.	APR.	MAY	JUNE	JULY	AUG.	SEPT.	OCT.	NOV.	DEC.
Rural Interstate												
Sunday	1.29	1.22	1.03	1.01	1.06	0.98	0.95	1.03	1.10	0.99	1.01	1.10
Monday	1.16	1.12	1.03	1.06	1.03	0.98	1.00	1.07	1.08	1.05	1.08	1.07
Tuesday	1.16	1.12	1.05	1.04	1.02	0.98	1.00	1.05	1.06	1.05	1.01	1.02
Wednesday	1.11	1.10	1.00	1.01	0.98	0.94	0.96	1.00	1.05	1.01	0.94	1.01
Thursday	1.08	1.04	0.91	0.92	0.91	0.87	0.90	0.93	0.98	0.94	1.02	0.98
Friday	0.99	0.92	0.80	0.84	0.84	0.80	0.82	0.83	0.86	0.82	0.90	0.91
Saturday	1.17	1.20	0.97	1.03	1.08	0.92	0.92	0.99	1.09	1.03	1.02	1.01
Rural Other												
Sunday	1.50	1.44	1.32	1.22	1.21	1.19	1.18	1.21	1.24	1.25	1.35	1.42
Monday	1.10	1.04	1.02	0.97	0.98	0.94	0.97	0.94	1.01	0.96	0.98	1.04
Tuesday	1.07	1.02	0.98	0.94	0.92	0.93	0.94	0.93	0.93	0.95	0.97	1.02
Wednesday	1.07	1.01	0.96	0.94	0.91	0.92	0.93	0.93	0.93	0.93	0.95	1.01
Thursday	1.03	0.99	0.94	0.90	0.88	0.89	0.91	0.90	0.90	0.90	0.99	0.98
Friday	0.98	0.90	0.90	0.84	0.81	0.82	0.84	0.81	0.81	0.82	0.90	0.92
Saturday	1.24	1.15	1.12	1.02	0.99	0.97	0.98	0.98	1.00	0.99	1.09	1.17
Urban												
Sunday	1.46	1.35	1.21	1.20	1.19	1.14	1.14	1.18	1.22	1.19	1.23	1.33
Monday	1.09	1.03	1.00	0.98	0.99	0.94	0.96	0.96	1.02	0.97	0.99	1.01
Tuesday	1.08	1.00	0.97	0.96	0.94	0.93	0.93	0.94	0.96	0.96	0.95	0.99
Wednesday	1.05	1.01	0.94	0.94	0.92	0.91	0.91	0.92	0.94	0.94	0.93	0.97
Thursday	1.01	0.98	0.89	0.90	0.88	0.87	0.89	0.89	0.90	0.90	0.99	0.95
Friday	0.95	0.88	0.87	0.84	0.82	0.81	0.83	0.82	0.83	0.83	0.90	0.89
Saturday	1.24	1.16	1.08	1.05	1.05	0.99	1.00	1.02	1.06	1.05	1.08	1.14
Recreational												
Sunday	1.41	1.19	1.04	1.00	0.94	0.79	0.71	0.90	0.83	0.76	1.00	1.13
Monday	1.70	1.54	1.16	1.11	1.05	0.87	0.83	1.03	1.06	0.91	1.15	1.31
Tuesday	1.78	1.60	1.22	1.14	1.06	0.83	0.81	1.06	1.11	0.95	1.24	1.28
Wednesday	1.82	1.68	1.20	1.14	1.05	0.85	0.78	1.00	1.11	0.94	1.13	1.28
Thursday	1.61	1.52	1.21	0.99	1.03	0.84	0.76	0.95	1.05	0.89	1.04	1.25
Friday	1.26	1.04	0.97	0.88	0.91	0.73	0.71	0.83	0.91	0.74	0.81	0.95
Saturday	1.09	0.87	0.84	0.87	0.83	0.71	0.66	0.71	0.84	0.68	0.75	0.85

Appendix D.2
Equations and Sample Calculations

Equation 1: General formula used to convert default population/VMT data, local DVMT, and local vehicle count summaries into MOVES source type population data

$$Population_{Source\ Type} = A \cdot B \cdot C$$

where:

$$A = \sum (Vehicle\ Fraction_{Road} \cdot DVMT_{Road})_{HPMS}$$

$$B = \left(\frac{Default\ Population_{\ Source\ Type}}{Default\ VMT_{Source\ Type}}\right)_{MOVES}$$

$$C = \frac{(Default\ VMT_{Source\ Type})_{MOVES}}{\sum(Default\ VMT_{Source\ Type})_{HPMS\ to\ MOVES}}$$

Sample Calculations Source Type Population:

Knox County - Passenger Car

$$\begin{aligned} A = [&(0.7090 \cdot 498{,}500) + (0.8149 \cdot 5{,}194{,}493) + (0.0000 \cdot 0) + (0.9232 \cdot 58{,}604) \\ &+ (0.8973 \cdot 0) + (0.9283 \cdot 2{,}662{,}076) + (0.9356 \cdot 81{,}947) \\ &+ (0.9461 \cdot 2{,}278{,}761) + (0.9523 \cdot 87{,}171) + (0.9686 \cdot 810{,}233) \\ &+ (0.9611 \cdot 114{,}023) + (0.9686 \cdot 51{,}429) + (0.9611 \cdot 117{,}858) \\ &+ (0.9686 \cdot 2{,}815{,}096)] \cong 13{,}211{,}704\ miles/day \end{aligned}$$

$$B = \left(\frac{244{,}705\ Passenger\ Cars}{2{,}628{,}956{,}000\ miles/year}\right) \cong 9.3081 \cdot 10^{-5} \frac{Passenger\ Cars}{miles/year}$$

$$C = \frac{2{,}628{,}956{,}000\, miles/year}{(2{,}628{,}956{,}000 + 1{,}897{,}590{,}600 + 482{,}319{,}900)\, miles/year} \cong 0.5249$$

$$Local\ Population_{Passenger\ Car}$$

$$= 13{,}211{,}704\ \frac{miles}{day} \cdot \left(\frac{9.3081 \cdot 10^{-5}\ Pass\ Cars}{miles/year}\right) \cdot 0.5249 \cdot \left(\frac{365\ days}{year}\right)$$

$$\cong\ 235{,}589\ Passenger\ Cars$$

Knox County - Combination Long-haul Truck

$$A = [(0.2465 \cdot 498{,}500) + (0.1536 \cdot 5{,}194{,}493\ ) + (0.0000 \cdot 0) + (0.0499\ \cdot 58{,}604)$$
$$+ (0.0658 \cdot 0) + (0.0444 \cdot 2{,}662{,}076) + (0.0352\ \cdot 81{,}947)$$
$$+ (0.0309 \cdot 2{,}278{,}761) + (0.0193 \cdot 87{,}171) + (0.0138\ \cdot 810{,}233)$$
$$+ (0.0157\ \cdot 114{,}023) + (0.0138 \cdot 51{,}429) + (0.0157\ \cdot 117{,}858\ )$$
$$+ (0.0138\ \cdot 2{,}815{,}096\ )]\ \cong 1{,}171{,}045\ miles/day$$

$$B = \left(\frac{2{,}152\ Comb\ Long - haul\ Trucks}{202{,}807{,}600\ miles/year}\right) \cong 1.0611 \cdot 10^{-5}\, \frac{Comb\ Long - haul\ Trucks}{miles/year}$$

$$C = \frac{202{,}807{,}600\, miles/year}{(59{,}763{,}440 + 202{,}807{,}600)\, miles/year} \cong 0.7724$$

$$Local\ Population_{Combination\ Long-haul\ Truck}$$

$$= 1{,}171{,}045\ \frac{miles}{day} \cdot \left(\frac{1.0611 \cdot 10^{-5}\ Comb\ Long - haul\ Trucks}{miles/year}\right) \cdot 0.7724$$

$$\cdot \left(\frac{365\ days}{year}\right) \cong 3{,}503\ Combination\ Long - haul\ Trucks$$

Equation 2: General formula used to convert HPMS local DVMT and vehicle classification summaries into MOVES road type VMT distributions by source types

$$VMT\ Fraction_{\ MOVES\ Road\ Type\ for\ Source\ Type} = \left({}^{A}/_{B}\right)_{Road\ Type\ for\ Source\ Type}$$

$$A = \left(\sum Fraction_{Vehicle\ Type} \cdot Local\ DVMT\right)_{HPMS\ to\ MOVES}$$

$$B = \left(\sum A_{Road\ Types}\right)_{HPMS\ to\ MOVES}$$

Sample Calculations VMT Distribution:

Knox County - Passenger Car

$$A_{Rural\ Restricted} = \left((0.7090 \cdot 498{,}500) + (0.0000 \cdot 0)\right) = 353{,}433\ miles/day$$

$$A_{Rural\ Unrestricted} = \left((0.8973 \cdot 0) + (0.9356 \cdot 81{,}947) + (0.9523 \cdot 87{,}171) + (0.9611 \cdot 114{,}023) + (0.9611 \cdot 117{,}858)\right) = 382{,}536\ miles/day$$

$$A_{Urban\ Restricted} = \left((0.8149 \cdot 5{,}194{,}493) + (0.9232 \cdot 58{,}604)\right) = 4{,}287{,}133\ miles/day$$

$$A_{Urban\ Unrestricted} = \left((0.9283 \cdot 2{,}662{,}076) + (0.9461 \cdot 2{,}278{,}761) + (0.9686 \cdot 810{,}233) + (0.9686 \cdot 51{,}429) + (0.9686 \cdot 2{,}815{,}096)\right) = 8{,}188{,}602\ miles/day$$

$$B = 353{,}433 + 382{,}536 + 4{,}287{,}133 + 8{,}188{,}602 = 13{,}211{,}704\ miles/day$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left({}^{353{,}433\ miles/day}/_{13{,}211{,}704\ miles/day}\right) = 0.0268$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(382{,}536\ miles/day \Big/ 13{,}211{,}704\ miles/day\right) = 0.0290$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(4{,}287{,}133\ miles/day \Big/ 13{,}211{,}704\ miles/day\right)$$

$$= 0.3245$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(8{,}188{,}602\ miles/day \Big/ 13{,}211{,}704\ miles/day\right)$$

$$= 0.6198$$

Knox County - Combination Long-haul truck

$$A_{Rural\ Restricted} = \left((0.2465 \cdot 498{,}500) + (0.0000 \cdot 0)\right) = 122{,}879\ miles/day$$

$$A_{Rural\ Unrestricted}$$
$$= \left((0.0658 \cdot 0) + (0.0352 \cdot 81{,}947) + (0.0193 \cdot 87{,}171)\right.$$
$$\left. + (0.0157 \cdot 114{,}023) + (0.0157 \cdot 117{,}858)\right) = 8{,}211\ miles/day$$

$$A_{Urban\ Restricted} = \left((0.1536 \cdot 5{,}194{,}493) + (0.0499 \cdot 58{,}604)\right) = 800{,}762\ miles/day$$

$$A_{Urban\ Unrestricted}$$
$$= \left((0.0444 \cdot 2{,}662{,}076) + (0.0309 \cdot 2{,}278{,}761) + (0.0138 \cdot 810{,}233)\right.$$
$$\left. + (0.0138 \cdot 51{,}429) + (0.0138 \cdot 2{,}815{,}096)\right) = 239{,}194\ miles/day$$

$$B = 122{,}879 + 8{,}211 + 800{,}762 + 239{,}194 = 1{,}171{,}045\ miles/day$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(122{,}879\ miles/day \Big/ 1{,}171{,}045\ miles/day\right) = 0.1049$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(8{,}211\ miles/day \Big/ 1{,}171{,}045\ miles/day \right) = 0.0070$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(800{,}762\ miles/day \Big/ 1{,}171{,}045\ miles/day \right) = 0.6838$$

$$VMT\ Fraction_{\ Rural\ Restricted} = \left(239{,}194\ miles/day \Big/ 1{,}171{,}045\ miles/day \right) = 0.2043$$

Equation 3: General formula used to calculate local AADVMT for HPMS vehicle types

$$AADVMT = \sum (Vehicle\ Fraction_{Road}\ \cdot\ DVMT_{Road})_{HPMS}$$

Sample Calculations AAVMT Distribution:

Knox County – Passenger Car

$$\begin{aligned} AADVMT = [&(0.7090 \cdot 498{,}500) + (0.8149 \cdot 5{,}194{,}493\ ) + (0.0000 \cdot 0) \\ &+ (0.9232\ \cdot 58{,}604) + (0.8973 \cdot 0) + (0.9283 \cdot 2{,}662{,}076) \\ &+ (0.9356\ \cdot 81{,}947) + (0.9461 \cdot 2{,}278{,}761) + (0.9523 \cdot 87{,}171) \\ &+ (0.9686\ \cdot 810{,}233) + (0.9611\ \cdot 114{,}023) + (0.9686 \cdot 51{,}429) \\ &+ (0.9611\ \cdot 117{,}858\ ) + (0.9686\ \cdot 2{,}815{,}096\ )] \cong 13{,}211{,}704\ miles/day \end{aligned}$$

Knox County – Combination Long-haul Truck

$$\begin{aligned} AADVMT = [&(0.2465 \cdot 498{,}500) + (0.1536 \cdot 5{,}194{,}493\ ) + (0.0000 \cdot 0) \\ &+ (0.0499\ \cdot 58{,}604) + (0.0658 \cdot 0) + (0.0444 \cdot 2{,}662{,}076) \\ &+ (0.0352\ \cdot 81{,}947) + (0.0309 \cdot 2{,}278{,}761) + (0.0193 \cdot 87{,}171) \\ &+ (0.0138\ \cdot 810{,}233) + (0.0157\ \cdot 114{,}023) + (0.0138 \cdot 51{,}429) \\ &+ (0.0157\ \cdot 117{,}858\ ) + (0.0138\ \cdot 2{,}815{,}096\ )]\ \cong 1{,}171{,}045\ miles/day \end{aligned}$$

Appendix E

Interagency Consultation

Nashville Area
Air Quality Interagency Consultation Group
1:00 pm Central, Thursday, July 12, 2018
Primary Access Number: 720-279-0026
Guest Passcode: 140 699 8445

AGENDA

1. Roll call
2. Purpose of this call - Marc Corrigan
3. Public Chapter 953 - Greg Riggs
4. Required Noninterference Demonstration - EPA
5. Discussion of analysis year(s) - Marc Corrigan, Greg Riggs
6. Discussion of existing MVEBs and SIP considerations - Marc Corrigan, Dianna Myers, All
7. Discussion of planning assumptions and data needs - All
8. Questions, other business - All
9. Next steps - All

Middle Tennessee Summary of Planning Assumptions for the Noninterference Demonstration for the Removal of the Middle Tennessee Inspection and Maintenance (I/M) Program

1. Introduction

Areas designated as moderate nonattainment or higher for carbon monoxide or ozone are required to implement a motor vehicle inspection and maintenance program (I/M; i.e., an emissions inspection program) in accordance with the CAA, Sections 187(a)(4) and 182(b)(4). The requirements for an inspection and maintenance program were established in the Code of Federal Regulation (CFR) under Title 40 CFR Part 51.

Davidson County implemented an I/M program in response to the nonattainment designations from the 1977 Clean Air Act. Davidson County began emissions testing of light duty vehicles in 1985. The passage of the 1990 Clean Air Act Amendments required expansion of the existing vehicle Inspection and Maintenance Program in Davidson County due to the moderate ozone nonattainment classification for the 1-Hour Ozone NAAQS. The EPA published the November 6, 1991, Federal Register, designating Davidson, Rutherford, Sumner, Williamson and Wilson counties as a moderate ozone nonattainment area. A designation of moderate nonattainment required the implementation of an I/M program.

On May 19, 1993, legislation signed by the Governor, becoming Public Chapter 416 of 1993, required county clerks not renew motor vehicle registrations without a passing emissions test in the four county area (Rutherford, Sumner, Williamson and Wilson Counties). The bill established the Tennessee Air Pollution Control Board's authority to implement I/M, allowed for fleet testing, and required counties to pass resolutions requesting that the State implement the program. On December 1, 1994, emissions testing started in the four county Middle Tennessee area.

In August of 2017, it was announced that all counties in Tennessee were meeting the NAAQS for ozone and particulate matter. This was the first time since air quality monitoring started in the 1970s that Tennessee had been designated attainment statewide for both ozone and particulate matter.

In light of the statewide attainment designation, legislation was introduced in January eliminating the I/M program in Hamilton, Rutherford, Sumner, Williamson and Wilson counties. Davidson county was given the option to retain their I/M program. On May 15th, Governor Haslam signed into law Public Chapter 953. Public Chapter 953 essentially directs TDEC to undertake a revision to the State Implementation Plan to eliminate the I/M program.

The Nashville Area has a MVEB for VOCs and NOx approved and corrected on January 23, 2006 (71 FR 3412) as 21.93 and 45.76 tons/day, respectively, established for the 2016 year. If the Nashville area ever becomes nonattainment for ozone these MVEBs

would be the applicable MVEBs. These MVEBs were developed using an earlier version of EPA's onroad emissions factor model, MOBILE6.2. EPA's current onroad emissions factor model estimates emissions at different levels than did MOBILE6.2. One of the objectives of this effort is to evaluate the suitability of the existing MVEBs, and amend as necessary.

> Question: If it is determined that the MVEBs need to be amended, how would that be done? Would a new one need to be set for the same year, different year, other?

This document seeks to provide a detailed listing of the procedures and planning assumptions for the applicable emissions inventory development for a noninterference demonstration and evaluation of the existing MVEB, and if necessary, development of a replacement MVEB.

This summary is submitted to Interagency Consultation (IAC) in accordance with Section 93.105(c)(1)(i) of the Transportation Conformity Rule which requires interagency review of the model(s) and associated methods and assumptions used in the development of MVEBs.

2. Planning Assumptions

Development of the onroad sector of the emissions inventory will be developed per EPA's *Using MOVES to Prepare Emissions Inventories for State Implementation Plans and Transportation Conformity: MOVES2014 Technical Guidance*[1].

General Methods and Assumptions

Geographic area: Middle Tennessee Counties: Davidson, Rutherford, Sumner, Williamson and Wilson

Pollutants: CO, NOx, and VOC

Inventory Sectors: Point, Area, Nonroad and Onroad

Base Year for growth projections (used for point and area source growth): 2014

Analysis Year: 2022

MOVES Model Assumptions

Emission Factor Model: MOVES2014a

[1] *Using MOVES to Prepare Emissions Inventories for State Implementation Plans and Transportation Conformity: MOVES2014 Technical Guidance,* US EPA, EPA-420-B-15-007, January 2015.

MOVES Runspec Development:

- Scale: County level scale – Inventory mode
- Time Span: year, 2022, by hour (will post process to generate annual emissions), all months, weekday and weekend day, all hours
- Geographic bounds: Davidson, Rutherford, Sumner, Williamson and Wilson Counties
- Vehicles/Equipment: Gasoline and diesel fuels, all vehicle combinations (the AVFT file may need to be edited to remove CNG from the transit bus fleet unless there are CNG fueled transit buses)
- Fuels: Adjust RVP for 2022 to regulatory maximum
- Road type: All
- Pollutants and Processes: CO, NOx and VOC and any supporting pollutants
- Output:
    - General:
        - Units: grams, joules, miles
        - Activity: Distance Traveled, Population
    - Output Emissions Detail
        - On road: Road Type, Source Use Type

Table 1 lists the inputs proposed to populate the County Data Manager (CDM) in MOVES.

Table 1. Proposed MOVES Input Data for Middle Tennessee.

	Input Data Requirement:	**Source:**	**Comments:**
1.	Road type distribution: VMT fractions by road type	Data from TDM for 2022, do we need other year(s)?	
2.	Source type population: number of vehicles in the area to be modeled.	sourceType Population: Data developed by TDOT from Dept. of Revenue data for 2014. How do we generate future populations? Use TDM vehicle ownership submodel to grow some source types, and employment growth for commercial vehicles?	
3.	Vehicle type VMT (several different types): 1. VMT by 6 HPMS vehicle types (HPMSvTypeYear) 2. VMT fraction by month by sourcetype 3. VMT fraction by day (weekday vs. weekend) by sourcetype 4. VMT fraction by hour by road type and sourcetype	1. Depending on the year may determine how VMT are generated 2. Month fractions from UT report for 2014 3. Day fractions from UT report for 2014 4. For 2022 will need to come from TDM; earlier year – may have EPA NEI data available	
4.	I/M Programs	Developed by TDEC APC and Metro	
5.	Age distribution: 1 to 30 years for MOVES source types (13 types).	UT data available for 2014. Assume same age distribution for all future years.	

6.	Average speed distribution: fraction of driving time in each speed bin for each sourcetype by roadtype for each hour of the day	Obtained from TDM.	
7.	Fuel supply and formulation information if different from default information.	For historical years, use the MOVES defaults since it is based on sampling data. For future years, develop 'worst case' fuel formulations (maximum RVP) as per EPA guidance	Note: change the year on the FuelSupplyYear tab to applicable year if necessary.
8.	Meteorological data: temperature and humidity for each hour of the day for a typical day in the month.	Average of most recent 3 years of available data	zonemonthhour.xlsx
9.	Ramp fraction: percent VHT on the ramp for controlled access facilities.	Obtain from TDM	

MEETING NOTES
Nashville Area Interagency Consultation (IAC) Group
July 12, 2018

Participants:

Lynorae Benjamin, EPA Region 4
Sean Santalla – FHWA TN
Elizabeth Watkins – FHWA TN
Hary Prawiranata – Nashville MPO
Ian Preston – TDOT
John Finke – Metro Public Health
Eric McCann – Metro Public Health
Blake McClain – Metro Public Health
Marc Corrigan – TDEC APC
Greg Riggs – TDEC APC

Purpose of call:

Marc Corrigan provided an overview of the purpose of today's call which was to discuss proposed planning assumptions for the noninterference demonstration for the removal of the Middle Tennessee I/M Program from the State SIP, and any potential implications to the existing MVEBs.

Public Chapter 953

Greg Riggs provided an overview of Public Chapter 953 which was signed by Governor Haslam on May 15, 2018. The law seeks to eliminate the I/M program in Hamilton, Rutherford, Sumner, Williamson and Wilson counties when the state receives EPA approval to do so. The law allowed Metro Nashville/Davidson County to choose whether to continue its program. The Metro Council voted to keep their testing program and to review it periodically.

Required Noninterference Demonstration

Lynorae Benjamin noted that in order to meet the requirements of the Clean Air Act in removing the I/M program from the state's SIP, the state will need to develop a noninterference demonstration in order to demonstrate that the removal of the program will not interfere with the area's ability to continue to meet all the NAAQS requirements. The demonstration will need to compare the area's emissions with and without the I/M program. This impact needs to be evaluated and considered relative to all of the NAAQS. Lynorae stated that the EPA has recently worked with North Carolina in removing their I/M program from 22 counties in the state and recommended that as an example.

Discussion of analysis years

After internal discussion, and discussion with the Davidson County local air program, an analysis year of 2022 was selected as the most likely first complete calendar year without an I/M program. Thus, 2022 is proposed as the analysis year for the noninterference demonstration. It was agreed by the group that this is the best year for the analysis. Marc discussed the pollutants for which a quantitative versus a qualitative analysis would need to be conducted. Lynorae agreed that looking quantitatively at CO, NOx and VOCs and qualitatively at the other NAAQS would be sufficient.

Discussion of existing MVEBs and SIP considerations

The Nashville Area has MVEBs (or budgets) approved in 2006 for the calendar year 2016 in the Nashville area's second 10-year maintenance plan for the one hour ozone NAAQS. The existing budgets are: 21.93 and 45.76 tons/day for VOCs and NOx, respectively. If the Nashville area ever becomes nonattainment for ozone these MVEBs would be the applicable MVEBs. These MVEBs were developed using an earlier version of EPA's onroad emissions factor model, MOBILE6.2. EPA's current onroad emissions factor model estimates emissions at different levels than did MOBILE6.2. Marc stated that one of the objectives of this effort is to evaluate the suitability of the existing MVEBs, and amend as necessary.

Marc posed the question to the EPA and IAC: if it is determined that the MVEBs need to be amended, how would that be done? Would a new one need to be set for the same year, or would another year address and remove the existing budget? Marc expressed the concern that he wanted to ensure that if the budget needed to be addressed, that the existing budget be removed entirely, and asked EPA how that would be done. He used a theoretical example of setting a new budget for 2022. Then, in theory, if the MPO had to conduct conformity for the year 2020, would the 'old' 2016 MVEB still remain applicable as the relevant budget? Marc wanted to avoid this circumstance, and make certain that what was done fully addressed the existing budget. Marc posed the idea of developing a budget for 2014, if this could fully replace the existing 2016 MVEBs. Marc asked about how any safety margin would be calculated for either the 2014 or 2022 budget, if developed. Lynorae said that Dianna would research these questions and the possibility of using an Early Progress Plan to remove the 2016 budget.

It was decided to wait for Dianna's response on which year, if needed, to develop a new MVEB for the area.

Hary expressed concern about the area meeting the old MVEBs especially in light of the potential increase in emissions from the termination of the I/M program.

John Finke elaborated on the explanation of Metro Council's decision on keeping the I/M Program in Davidson Co. He stated that the council was giving itself some time to

be able to make an informed decision on whether to keep the I/M program. Metro's existing contracts with the testing contractors ends June 30, 2022.

Discussion of planning assumptions and data needs

The MPO and TDEC recently developed planning assumptions for calendar year 2020 in response to legislation passed in 2017 exempting additional model years from the I/M programs in Tennessee. In discussion, it was decided since the MPO did not have a TDM network for 2022, each of the inputs were examined to determine if the already developed input for 2020 would be suitable, and which ones would need to be modified for 2022. Table one below, summarizes the results of the discussion on the determination of data sources for each of the MOVES inputs.

Table 1. **MOVES Input Data Sources for Middle Tennessee**

	Input Data Requirement:	**Source:**
1.	Road type distribution: VMT fractions by road type.	Data from TDM for 2020
2.	Source type population: number of vehicles in the area to be modeled.	Data developed by TDOT from Dept. of Revenue data for 2014 grown using growth factors developed by MPO out to 2022
3.	Vehicle type VMT (several different types): 1. VMT by 5 HPMS vehicle types (HPMSvTypeYear) 2. VMT fraction by hour by road type and sourcetype. 3. VMT fraction by day (weekday vs. weekend) by Sourcetype 4. VMT fraction by hour by road type and sourcetype	 1.Use data from TDM interpolated to 2022 2. Month fractions from UT report for 2014 3. Day fractions from UT report for 2014 4. Develop from 2020 TDM
4.	I/M Programs	Developed by TDEC APC and Metro
5.	Age distribution: 1 to 30 years for MOVES source types (13 types)	UT data available for 2014. Assume same age distribution for all future years.
6.	Average speed distribution: fraction of driving time in each speed bin for each sourcetype by roadtype for each hour of the day.	Obtained from TDM for 2020. Convert average speed to distribution using MOVES converter
7.	Fuel supply and formulation information if different from default information.	For historical years, use the MOVES defaults since it is based on sampling data. For future years, develop 'worst case' fuel formulations (maximum RVP) as per EPA guidance
8.	Meteorological data: temperature and humidity for each hour of the	Average of most recent 3 years of available data

	day for a typical day in the month.	
9.	Ramp fraction: percent VHT on the ramp for controlled access facilities.	Obtain from TDM for 2020

Not included in the table, but discussed by the IAC was an 'I/M Fraction' developed by the MPO. This fraction is the fraction of VMT accumulated in each county by vehicles 'subject to I/M' (those actually registered in counties subject to I/M). It was decided that since these are fractions, that 2020 would be suitable.

Next Steps

Hary Prawarinata requested that Marc send him an email to coordinate with the MPO on interpolating the inputs that will need to be adjusted to 2022.

Nashville Area IAC Call Notes

110(l) Noninterference Demonstration

June 19th, 2019: 10:00 AM Eastern, 9:00 AM Central

Attendees:

Greg Riggs, TDEC APC
Mark Reynolds, TDEC APC
Marc Corrigan, TDEC APC
Kwabena Aboagye (KB), TDOT
Melanie Murphy, TDOT
Hary Prawiranata, Nashville MPO
John Finke, Metro Nashville PCD
Eric McCann, Metro Nashville PCD
Jim Baggett, Intern, TDEC APC
Dianna Myers, EPA
Sean Santalla, FHWA-TN

Marc welcomed the attendees to the call and thanked them for their participation. Greg provided an overview of recent legislation that has led to the preparation of the 110L SIP amendment under discussion today.

Public Chapter 953 was enacted by the 110th General Assembly and signed by Governor Haslam on May 15, 2018. The law seeks to eliminate the vehicle emissions testing program (Inspection and Maintenance Program, or IM) in the state. However, IM programs operating in counties that are managed by a local program were given the option of continuing their program. As a result of this option, the Nashville City Council elected to continue their IM program at least until the impact of the program could be assessed.

As a part of the State Implementation Plan (SIP), Tennessee has used vehicle emissions testing as a control measure to improve air quality and help meet the National Ambient Air Quality Standards, or NAAQS, in the counties that have a vehicle emissions testing program. Currently, Middle Tennessee has no nonattainment areas of the NAAQS for the six criteria pollutants. However, Tennessee is required to attain or maintain air quality if the IM program is eliminated.

In order to eliminate the IM program from the SIP, a SIP revision is required. The EPA requires a demonstration that removal of the IM program will not interfere with attaining or maintaining any air quality standard per section 110(l) of the Clean Air Act. As ozone is the primary standard of concern, the 110(l) demonstration compares the emissions and ozone levels with and without the IM program in the projected future year when the program is removed.

The full requirements of the current IM program are found in Chapter 29 of the Tennessee Air Pollution Control Regulations (TAPCR 1200-03-29). Due to the passage of Public Chapter 953, Chapter 29 will need to be revised to conform to the language in Public Chapter 953.

Marc introduced Mark Reynolds with the Air Pollution Control Division to the IAC. Mark was the principal author of the narrative portion of the 110(l) demonstration. Mark provided an overview of the demonstration's narrative.

This document makes the case that removing the IM program does not interfere with maintaining the NAAQS for the six criteria pollutants and any increases in air pollution are very small. Ozone is the primary standard of concern in the demonstration.

In this document, we are proving that removing the IM program does not interfere with maintaining compliance with the National Ambient Air Quality Standards (NAAQS) for the six criteria pollutants:

- ozone (O3)
- fine particulate matter (PM2.5)
- sulfur dioxide (SO2)
- nitrogen dioxide (NO2)
- carbon monoxide (CO)
- lead (Pb)

Our main reason that removing the IM program will not interfere with the NAAQS is that the increase in emissions is very small.

Mark gave a history of the IM program in Middle Tennessee, which began in the eighties for Davidson County, then expanded to the four surrounding counties in the early nineties, then in 2005 as part of an Early Action Compact (EAC) to avoid being designated as nonattainment for ozone, the program was expanded to begin OBD testing.

Emissions inventories are a key part of the noninterference demonstration. We used the 2014 NEI as the base year in developing the emissions inventory and projected out to 2022 which is the first full year projected without the IM program.

Marc gave a summary of the development of the onroad mobile source emissions portion of the draft limited maintenance plan, contained in Appendix C. Marc stated that the MOVES model (2014b) was run with a large amount of locally developed data, which includes vehicle population, vehicle miles traveled (VMT), speeds, meteorology, day, month and hour fractions, and distribution of the VMT on different road types (road type distribution). Marc noted that all vehicle types were included and CO, NOx and VOCs were the pollutants considered. Emissions were projected in 2022. Local meteorological data was obtained from NOAA at the Nashville airport for 2015-2017. Marc discussed the source type population categories including the passenger car, passenger truck, and light commercial trucks categories. Marc pointed out that Figure 1 in the appendix used a linear line to estimate light duty vehicle population in 2022 based on historical vehicle emissions testing numbers.

The source type population projections for the remaining source types were derived from the Nashville Area TPO's Travel Demand Model (TMD); that data is summarized in Table 4. VMT and average speed distribution also came from the TDM. The vehicle age distribution came from annual registration data

prepared by UT for TDOT. Marc went over the IM related inputs into the MOVES model which uses a compliance factor input to account for IM program compliance rates, waiver rates, and adjustments needed to account for the fraction of vehicles within a source type that are covered by the IM program. Marc concluded by summarizing Tables 12, 13, and 14 in the appendix and pointing out the model predicted an increase in NOx emissions of 478 tons/year due to removal of the I/M program.

Mark briefly discussed what is included in the nonroad mobile, point and nonpoint sectors and how each sector contributes to the total emissions, pointing out the tables in the narrative that summarized these emissions.

Mark reiterated that the onroad sector is the only sector affected by the IM program. Without the IM program, the onroad sector emissions would increase as follows: 12.5% in CO emissions, 2.2% in NOx emissions and a 6.9% in VOC emissions in 2022. Without the IM program, the emissions increase from all sectors combined would be: 6.9% increase in CO emissions, 1.1% increase in NOx emissions and a 1.5% increase in VOC emissions.

The sensitivity of ozone to NOx and VOC emissions was discussed. TDEC APC used a previously completed photochemical modeling sensitivity analysis to help quantify the potential impact of the removal of the IM program on ozone. The analysis indicated that removal of the IM program would only increase the ozone design value by about 0.26 ppb.

Mark mentioned additional measures that may help the area continue demonstrating maintenance of the NAAQS, including the TVA and VW court settlements. Mark illustrated that these settlements may lead to additional reductions in ozone forming pollutants, especially large NOx decreases in the power sector, and additional future decreases anticipated in the onroad sector. This provides further weight of evidence that the removal of the IM program will have insignificant impact on ozone concentrations in Middle Tennessee.

Current air quality data was briefly discussed. Mark pointed out that Table 17 and Figure 1 illustrate that ozone air quality data for the Chattanooga area has for a number of years remained consistently below all ozone NAAQS.

Mark concluded that the 110L demonstration illustrated that removing the IM program in Middle Tennessee will not interfere with continued attainment or maintenance of the NAAQS for the six criteria pollutants.

Hary asked how the impact of open burning is estimated. Mark responded by mentioning that there are records of prescribed burn permits as well as other records used to estimate the impact.

Comments and Responses

Comments received during the June 19, 2019 IAC Call:

Commenter	Comment	Response
Hary Prawiranata, Nashville MPO	Hary asked how the impact of open burning is estimated.	Mark responded by mentioning that there are records of prescribed burn permits as well as other records used to estimate the impact.

Comments received on June 28, 2019

EPA	Key Comment #1. See attached document	TDEC-APC is now requesting that the removal of the entire Chapter 29 of the TAPCR and Regulation 8 of Nashville Code from the Tennessee SIP.
EPA	Key Comment #2. See attached document	After further evaluation, EPA determined that the I/M program did not need to be moved into the contingency portion of the SIP.
EPA	General Comment #1. See attached document	The following sentence was added to Section 2.0: "All of the NAAQS will be evaluated in this demonstration; however, ozone will be the primary focus since the I/M program was a control strategy used to attain the ozone NAAQS."
EPA	General Comment #2. See attached document	The following sentence was added to Section 7.2: "If the increase in ozone (0.26 ppb) from the sensitivity analysis was added to the current ozone design value (67 ppb) then the result (67.26 ppb) would be less than the current NAAQS of 70 ppb."
EPA	General Comment #3. See attached document	The word "unmeasurable" was deleted.
EPA	General Comment #4. See attached document	Monitoring data for NO_2 and CO was added in Section 6.3 and 6.4, respectively.
EPA	General Comment #5. See attached document	This comment relates to the Hamilton County draft only so no changes are needed for the Middle Tennessee draft.

Appendix F

Nonroad Mobile Source Emissions Inventory

for Nine Categories

Nonroad Mobile Source Inventory-9 Major Categories

Emissions in tons per year

Davidson County (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	10.9	12.2	1.3
Commercial Equipment	7,220	310	295
Construction and Mining Equipment	1,438	1,227	187
Industrial Equipment	865	262	39
Lawn and Garden Equipment	17,783	293	1,140
Logging Equipment	1.6	0.2	0.2
Pleasure Craft	932	84	265
Railroad Equipment	5.9	3.1	0.6
Recreational Equipment	2,494	31	767
Total Emissions	30,750	2,223	2,696

Davidson County (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	3.3	3.6	0.4
Commercial Equipment	6,096	177	216
Construction and Mining Equipment	1,001	607	106
Industrial Equipment	689	159	23
Lawn and Garden Equipment	17,396	214	1,024
Logging Equipment	0.9	0.0	0.1
Pleasure Craft	827	73	137
Railroad Equipment	5.7	1.8	0.4
Recreational Equipment	1,212	14	205
Total Emissions	27,231	1,251	1,713

Rutherford County (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	60.8	68.1	7.3
Commercial Equipment	1,351	58	55
Construction and Mining Equipment	1,022	872	133
Industrial Equipment	528	144	23
Lawn and Garden Equipment	3,499	54	227
Logging Equipment	2.0	0.2	0.3
Pleasure Craft	195	18	56
Railroad Equipment	2.6	1.4	0.3
Recreational Equipment	1,042	13	328
Total Emissions	7,703	1,230	830

Rutherford County (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	18.3	20.2	2.0
Commercial Equipment	1,141	33	40
Construction and Mining Equipment	712	432	76
Industrial Equipment	420	88	14
Lawn and Garden Equipment	3,423	40	204
Logging Equipment	1.2	0.1	0.2
Pleasure Craft	173	15	29
Railroad Equipment	2.5	0.8	0.2
Recreational Equipment	507	6	88
Total Emissions	6,398	635	453

Sumner County (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	69.7	78.2	8.4
Commercial Equipment	818	35	33
Construction and Mining Equipment	350	299	46
Industrial Equipment	287	82	13
Lawn and Garden Equipment	1,944	29	127
Logging Equipment	4.7	0.6	0.6
Pleasure Craft	541	49	153
Railroad Equipment	1.1	0.6	0.1
Recreational Equipment	89.4	0.8	2.0
Total Emissions	4,105	574	382

Sumner County (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	21.0	23.2	2.3
Commercial Equipment	691	20	24
Construction and Mining Equipment	244	148	26
Industrial Equipment	229	50	8
Lawn and Garden Equipment	1,901	21	114
Logging Equipment	2.8	0.1	0.3
Pleasure Craft	480	43	79
Railroad Equipment	1.1	0.3	0.1
Recreational Equipment	43.5	0.4	0.5
Total Emissions	3,613	305	254

Williamson County (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	62.7	70.3	7.6
Commercial Equipment	1,702	73	69
Construction and Mining Equipment	699	597	91
Industrial Equipment	136	46	6
Lawn and Garden Equipment	3,282	54	211
Logging Equipment	4.8	0.6	0.6
Pleasure Craft	30.0	2.7	8.5
Railroad Equipment	2.6	1.4	0.3
Recreational Equipment	496	6	112
Total Emissions	6,416	851	507

Williamson County (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	18.9	20.9	2.1
Commercial Equipment	1,437	42	51
Construction and Mining Equipment	487	295	52
Industrial Equipment	108	28	4
Lawn and Garden Equipment	3,211	40	189
Logging Equipment	2.9	0.1	0.4
Pleasure Craft	26.7	2.4	4.4
Railroad Equipment	2.5	0.8	0.2
Recreational Equipment	241	3	30
Total Emissions	5,536	432	333

Wilson County (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	59.8	67.0	7.2
Commercial Equipment	699	30	29
Construction and Mining Equipment	293	250	38
Industrial Equipment	234	65	10
Lawn and Garden Equipment	1,372	21	90
Logging Equipment	3.5	0.4	0.4
Pleasure Craft	496	45	141
Railroad Equipment	0.0	0.0	0.0
Recreational Equipment	1,723	22	547
Total Emissions	4,880	499	862

Wilson County (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	18.0	19.9	2.0
Commercial Equipment	591	17	21
Construction and Mining Equipment	204	124	22
Industrial Equipment	186	39	6
Lawn and Garden Equipment	1,343	15	81
Logging Equipment	2.1	0.1	0.3
Pleasure Craft	440	39	73
Railroad Equipment	0.0	0.0	0.0
Recreational Equipment	837	10	146
Total Emissions	3,621	264	351

Total for all five counties (2014)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	264	296	32
Commercial Equipment	11,791	507	481
Construction and Mining Equipment	3,802	3,244	494
Industrial Equipment	2,050	599	92
Lawn and Garden Equipment	27,880	451	1,795
Logging Equipment	16.7	1.9	2.1
Pleasure Craft	2,194	198	624
Railroad Equipment	12.3	6.4	1.3
Recreational Equipment	5,845	72	1,756
Total Emissions	53,854	5,376	5,278

Total for all five counties (2022)

9 Major Categories	CO	NOx	VOC
Agricultural Equipment	79	88	9
Commercial Equipment	9,956	290	353
Construction and Mining Equipment	2,648	1,606	281
Industrial Equipment	1,632	364	55
Lawn and Garden Equipment	27,274	330	1,612
Logging Equipment	9.9	0.5	1.2
Pleasure Craft	1,947	173	323
Railroad Equipment	11.7	3.7	0.8
Recreational Equipment	2,840	33	469
Total Emissions	46,398	2,887	3,104

Appendix G

Nonroad Mobile Source Emissions Inventory

for Marine, Aircraft, and Rail

Marine, Airport, and Rail Emissions (in ton per year)

Carbon Monoxide (CO), Nitrogen Oxides (NOx), and Volatile Organic Compounds (VOC)

RAIL

			2014			2022		
County	**SCC**	**Description**	**CO**	**NOX**	**VOC**	**CO**	**NOX**	**VOC**
Davidson	2285002006	Line Haul Locomotives: Class I Operations[A]	98.80	584.87	31.54	84.26	498.80	26.90
Davidson	2285002010	Yard Locomotives	25.76	217.60	13.65	21.97	185.58	11.64
Rutherford	2285002010	Yard Locomotives	3.95	31.69	2.27	2.79	22.38	1.60
Rutherford	2285002006	Line Haul Locomotives: Class I Operations	62.19	444.43	21.50	43.91	313.84	15.18
Sumner	2285002006	Line Haul Locomotives: Class I Operations	36.94	263.99	12.77	26.08	186.42	9.02
Williamson	2285002006	Line Haul Locomotives: Class I Operations	67.92	485.42	23.48	47.96	342.78	16.58
Wilson	2285002007	Line Haul Locomotives: Class II / III Operations	2.67	27.09	1.05	1.99	20.26	0.79
Total Emissions			**298.2**	**2,055.1**	**106.3**	**229.0**	**1,570.1**	**81.7**

[A] CSX, which is a Class I railroad, owns the tracks through Davidson County. The emissions are calculated based on their reported ton-miles of freight transported. There is no data for how much of the freight is by Class II/III railroads, which are smaller railways.

MARINE

			2014			2022		
County	**SCC**	**Description**	**CO**	**NOX**	**VOC**	**CO**	**NOX**	**VOC**
Davidson	2280002100	Marine Vessels, Commercial	20.20	56.70	10.10	22.36	62.76	11.18
Sumner	2280002100	Marine Vessels, Commercial	0.16	0.85	0.01	0.20	1.01	0.01
Sumner	2280002200	Marine Vessels, Commercial	3.82	19.77	0.22	4.55	23.52	0.27
Wilson	2280002200	Marine Vessels, Commercial	5.81	30.06	0.34	6.92	35.76	0.41
Total Emissions			**30.0**	**107.4**	**10.7**	**34.0**	**123.1**	**11.9**

AIRPORT			2014			2022		
County	**SCC**	**Description**	**CO**	**NOX**	**VOC**	**CO**	**NOX**	**VOC**
Davidson	2265008005	Airport Ground Support Equipment (Gasoline 4-stroke)[B]	268.00	36.80	10.10	346.87	47.63	13.07
Davidson	2275050011	General Aviation[C]	1,647.00	687.70	173.00	1,684.28	703.27	176.92
Davidson	2275070000	Aircraft Auxiliary Power Units	2.80	17.10	27.00	2.86	17.49	27.61
Rutherford	2265008005	Airport Ground Support Equipment	0.06	0.01	0.00	0.10	0.02	0.00
Rutherford	2270008005	Airport Ground Support Equipment	0.30	0.05	0.01	0.48	0.08	0.02
Rutherford	2275001000	Military Aircraft	58.45	50.28	24.46	63.64	54.75	26.64
Rutherford	2275020000	Commercial Aircraft	1.37	0.83	0.41	3.20	1.95	0.95
Rutherford	2275050011	General Aviation	196.81	1.06	2.46	199.57	1.08	2.50
Rutherford	2275060011	Air Taxi - Piston	10.14	0.06	0.06	11.01	0.06	0.07
Rutherford	2275060012	Air Taxi - Turbine	5.26	0.99	1.31	5.71	1.08	1.43
Rutherford	2275070000	Aircraft Auxiliary Power Units	0.05	0.02	0.00	0.05	0.02	0.00
Sumner	2265008005	Airport Ground Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Sumner	2270008005	Airport Ground Support Equipment	0.00	0.00	0.00	0.00	0.00	0.00
Sumner	2275001000	Military Aircraft	2.92	2.51	1.22	3.18	2.74	1.33
Sumner	2275050011	General Aviation	95.63	0.52	1.20	96.97	0.52	1.21
Sumner	2275060011	Air Taxi - Piston	2.30	0.01	0.01	2.50	0.01	0.02
Sumner	2275060012	Air Taxi - Turbine	1.06	0.23	0.30	1.15	0.25	0.32
Wilson	2275001000	Military Aircraft	2.37	2.04	0.99	2.58	2.22	1.08
Wilson	2275050011	General Aviation	17.64	0.10	0.22	17.88	0.10	0.22
Wilson	2275060011	Air Taxi - Piston	1.43	0.01	0.01	1.55	0.01	0.01
Wilson	2275060012	Air Taxi - Turbine	0.66	0.14	0.18	0.72	0.15	0.20
Total Emissions			**2,314.2**	**800.5**	**243.0**	**2,444.3**	**833.4**	**253.6**

[B] Emissions provided by Metropolitan Nashville Airport Authority do not differentiate between gasoline and diesel-powered ground support equipment

[C] Emissions provided by Metropolitan Nashville Airport Authority put all aircraft emissions (LTO cycle) in one "lump" category

Appendix H

Point Source Emissions Inventory

for Davidson County

Point Source Emissions (in tons per year) for Davidson County Facilities

Actual Emissions in 2017 and Projected Emission in 2022

					Year 2017			Year 2022		
Facility Site Identifier	Facility Site Name	Unit Identifier	Emissions Process Identifier	SCC	NOx (tons)	CO (tons)	VOC (tons)	NOx (tons)	CO (tons)	VOC (tons)
4703700005	Innophos Inc.	003	1	30299998	0.330	0.278	0.018	0.400	0.337	0.022
4703700005	Innophos Inc.	004	1	30299998	0.336	0.280	0.019	0.407	0.339	0.022
4703700005	Innophos Inc.	005	1	30299998	0.323	0.271	0.018	0.391	0.328	0.022
4703700005	Innophos Inc.	006	1	30299998	1.220	1.021	0.067	1.478	1.237	0.081
4703700005	Innophos Inc.	007	1	30299998	2.479	2.082	0.150	3.003	2.522	0.182
4703700005	Innophos Inc.	010	1	10200602	3.338	2.804	0.183	3.965	3.330	0.217
4703700005	Innophos Inc.	011	1	30299998	0.233	0.000	0.000	0.282	0.000	0.000
4703700009	Vulcan Construction Materials, LP	001	2	30500251	3.460	17.280	4.250	3.910	19.527	4.803
4703700009	Vulcan Construction Materials, LP	003	1	30500290	0.000	0.340	2.170	0.000	0.384	2.452
4703700009	Vulcan Construction Materials, LP	004	6	20200102	2.460	0.530	0.200	2.870	0.618	0.233
4703700013	Greer Stop Nut, Inc.	001	2	30988801	0.000	0.000	2.710	0.000	0.000	3.464
4703700014	Gibson Guitar Custom Shop	001	1	40200401	0.000	0.000	18.460	0.000	0.000	25.724
4703700014	Gibson Guitar Custom Shop	001	2	40299998	0.000	0.000	0.004	0.000	0.000	0.006
4703700019	Vulcan Construction Materials, LP	004	1	30504099	3.522	0.759	0.286	4.495	0.969	0.365
4703700022	Dicaperl Minerals Corp.	001	1	30501801	1.530	1.285	0.084	1.953	1.640	0.107
4703700022	Dicaperl Minerals Corp.	001	2	30501801	0.745	0.620	0.039	0.951	0.791	0.050
4703700022	Dicaperl Minerals Corp.	001	3	30501801	0.785	0.665	0.045	1.002	0.849	0.057
4703700023	TruColor Litho, Inc	001	1	40500403	0.000	0.000	0.044	0.000	0.000	0.049
4703700023	TruColor Litho, Inc	001	2	40500403	0.000	0.000	1.010	0.000	0.000	1.133
4703700023	TruColor Litho, Inc	001	3	40500403	0.000	0.000	0.142	0.000	0.000	0.159
4703700023	TruColor Litho, Inc	001	4	40500403	0.000	0.000	0.220	0.000	0.000	0.246
4703700024	Douglas Printing Inc	001	1	40500403	0.000	0.000	2.110	0.000	0.000	2.368
4703700024	Douglas Printing Inc	001	2	40500403	0.000	0.000	0.120	0.000	0.000	0.135
4703700025	Ryman Hospitality Properties, Inc.	001	1	20100107	7.170	2.870	0.730	3.879	1.553	0.395
4703700025	Ryman Hospitality Properties, Inc.	002	1	10300602	1.700	1.290	0.060	2.135	1.620	0.075
4703700025	Ryman Hospitality Properties, Inc.	003	1	10300603	10.200	8.570	1.120	12.811	10.763	1.407
4703700025	Ryman Hospitality Properties, Inc.	003	2	10300501	0.930	0.230	0.030	1.162	0.287	0.037
4703700025	Ryman Hospitality Properties, Inc.	004	1	10300602	18.580	32.780	4.040	23.335	41.170	5.074
4703700025	Ryman Hospitality Properties, Inc.	004	2	10300602	0.970	0.970	0.030	1.218	1.218	0.038
4703700025	Ryman Hospitality Properties, Inc.	004	3	10300602	0.470	0.580	0.020	0.590	0.728	0.025
4703700025	Ryman Hospitality Properties, Inc.	004	4	10300503	0.030	0.020	0.000	0.037	0.025	0.000
4703700025	Ryman Hospitality Properties, Inc.	006	1	40200101	0.000	0.000	0.380	0.000	0.000	0.462
4703700025	Ryman Hospitality Properties, Inc.	006	2	40200901	0.000	0.000	0.040	0.000	0.000	0.056
4703700025	Ryman Hospitality Properties, Inc.	007	1	20100102	0.460	0.100	0.030	0.249	0.054	0.016
4703700025	Ryman Hospitality Properties, Inc.	010	1	10500206	21.900	18.400	2.410	27.505	23.109	3.027
4703700029	Purina Animal Nutrition, LLC	008	1	10200602	1.568	1.317	0.086	1.862	1.564	0.102
4703700032	Safety-Kleen Systems	001	1	49000206	0.000	0.000	0.200	0.000	0.000	0.230
4703700032	Safety-Kleen Systems	002	1	40188898	0.000	0.000	0.001	0.000	0.000	0.001
4703700032	Safety-Kleen Systems	003	1	49099998	0.000	0.000	0.003	0.000	0.000	0.003

4703700032	Safety-Kleen Systems	005	1	49099998	0.000	0.000	0.003	0.000	0.000	0.003
4703700033	Quikrete - Nashville	001	1	30590003	1.080	0.910	0.060	1.187	1.000	0.066
4703700037	Best One Tire & Service	002	1	30899999	0.000	0.000	0.165	0.000	0.000	0.226
4703700037	Best One Tire & Service	003	2	40200101	0.000	0.000	1.193	0.000	0.000	1.449
4703700037	Best One Tire & Service	003	3	40200101	0.000	0.000	0.660	0.000	0.000	0.802
4703700039	Vanderbilt University	004	1	10300603	4.732	3.975	0.260	5.943	4.992	0.327
4703700039	Vanderbilt University	005	1	20200107	3.270	0.720	0.220	3.815	0.840	0.257
4703700039	Vanderbilt University	005	2	20300207	0.350	0.040	0.140	0.440	0.050	0.176
4703700039	Vanderbilt University	008	1	20300202	17.630	19.160	2.480	22.142	24.064	3.115
4703700039	Vanderbilt University	008	2	20300202	20.040	20.420	2.940	25.169	25.646	3.692
4703700039	Vanderbilt University	008	3	20300202	32.930	33.610	4.470	41.358	42.212	5.614
4703700039	Vanderbilt University	009	1	10300602	11.770	12.170	1.490	14.782	15.285	1.871
4703700039	Vanderbilt University	009	2	10300502	0.030	0.020	0.000	0.037	0.025	0.000
4703700040	Carlex Glass America, LLC	001	1	30501403	746.200	6.740	6.240	952.330	8.602	7.964
4703700040	Carlex Glass America, LLC	009	1	10200602	3.140	2.640	0.170	3.729	3.136	0.202
4703700040	Carlex Glass America, LLC	009	2	10200602	0.780	0.660	0.040	0.926	0.784	0.048
4703700040	Carlex Glass America, LLC	009	3	10200602	1.190	1.000	0.070	1.413	1.188	0.083
4703700040	Carlex Glass America, LLC	009	4	10200602	0.890	0.750	0.050	1.057	0.891	0.059
4703700040	Carlex Glass America, LLC	009	5	10200602	1.380	1.160	0.080	1.639	1.378	0.095
4703700040	Carlex Glass America, LLC	009	6	10200602	2.040	1.710	0.110	2.423	2.031	0.131
4703700040	Carlex Glass America, LLC	009	7	10200602	1.530	1.290	0.080	1.817	1.532	0.095
4703700040	Carlex Glass America, LLC	009	8	10200602	0.780	0.660	0.040	0.926	0.784	0.048
4703700040	Carlex Glass America, LLC	009	9	10200602	0.120	0.100	0.006	0.143	0.119	0.007
4703700040	Carlex Glass America, LLC	010	1	40200101	0.000	0.000	10.230	0.000	0.000	12.429
4703700040	Carlex Glass America, LLC	012	1	30501407	3.060	0.640	0.170	3.905	0.817	0.217
4703700040	Carlex Glass America, LLC	013	1	10500106	1.720	0.360	0.090	2.043	0.428	0.107
4703700040	Carlex Glass America, LLC	014	1	40188898	0.000	0.000	7.620	0.000	0.000	9.272
4703700040	Carlex Glass America, LLC	015	1	20100102	0.237	0.054	0.007	0.128	0.029	0.004
4703700040	Carlex Glass America, LLC	015	2	20100102	0.101	0.023	0.003	0.055	0.012	0.002
4703700040	Carlex Glass America, LLC	015	4	20100102	0.048	0.011	0.001	0.026	0.006	0.001
4703700040	Carlex Glass America, LLC	015	5	20100102	0.097	0.022	0.003	0.052	0.012	0.002
4703700040	Carlex Glass America, LLC	015	6	20100102	0.060	0.014	0.002	0.032	0.008	0.001
4703700040	Carlex Glass America, LLC	015	7	20100102	0.139	0.032	0.004	0.075	0.017	0.002
4703700040	Carlex Glass America, LLC	016	1	30501407	0.000	0.000	9.440	0.000	0.000	12.048
4703700040	Carlex Glass America, LLC	017	1	30501407	0.000	0.000	0.170	0.000	0.000	0.217
4703700042	Triumph Aerostructures, LLC	001	1	10200602	0.086	0.072	0.005	0.102	0.086	0.006
4703700042	Triumph Aerostructures, LLC	001	3	10200602	3.158	2.653	0.174	3.751	3.151	0.207
4703700042	Triumph Aerostructures, LLC	002	1	10200603	0.948	0.796	0.052	1.126	0.945	0.062
4703700042	Triumph Aerostructures, LLC	003	1	10500106	4.688	3.938	0.258	5.568	4.677	0.306
4703700042	Triumph Aerostructures, LLC	006	1	20300101	0.172	0.040	0.010	0.215	0.050	0.012
4703700042	Triumph Aerostructures, LLC	007	1	40202499	0.000	0.000	2.729	0.000	0.000	3.353
4703700042	Triumph Aerostructures, LLC	012	1	40202405	0.000	0.000	7.940	0.000	0.000	9.756
4703700042	Triumph Aerostructures, LLC	014	1	40202401	0.000	0.000	2.337	0.000	0.000	2.872
4703700044	Saint Thomas Midtown Hospital	001	1	10300602	7.290	6.010	0.390	9.156	7.548	0.490
4703700044	Saint Thomas Midtown Hospital	001	2	10300502	0.010	0.000	0.000	0.012	0.000	0.000
4703700044	Saint Thomas Midtown Hospital	002	1	10300603	2.690	0.710	0.060	3.378	0.892	0.075
4703700049	Metro Water Services - Central WWTP	008	1	20200102	0.035	0.012	0.000	0.041	0.014	0.000

4703700049	Metro Water Services - Central WWTP	014	1	50100769	0.000	0.000	2.020	0.000	0.000	2.512
4703700049	Metro Water Services - Central WWTP	021	1	50100715	0.000	0.000	0.043	0.000	0.000	0.053
4703700049	Metro Water Services - Central WWTP	022	1	50100715	0.000	0.000	0.011	0.000	0.000	0.013
4703700049	Metro Water Services - Central WWTP	023	1	10300602	1.320	1.110	0.072	1.658	1.394	0.090
4703700049	Metro Water Services - Central WWTP	024	1	50100793	5.640	4.740	0.310	7.013	5.894	0.385
4703700049	Metro Water Services - Central WWTP	025	1	50100793	6.450	5.410	0.354	8.021	6.727	0.440
4703700049	Metro Water Services - Central WWTP	026	1	50100789	0.000	0.000	0.000	0.000	0.000	0.000
4703700050	Nashville District Energy System	010	1	10100602	6.320	22.220	1.450	15.858	55.752	3.638
4703700050	Nashville District Energy System	010	2	10101002	0.005	0.006	0.001	0.009	0.011	0.002
4703700058	The Tennessean	001	1	10300602	0.750	0.630	0.040	0.942	0.791	0.050
4703700058	The Tennessean	002	2	40500403	0.000	0.000	1.660	0.000	0.000	1.863
4703700058	The Tennessean	003	1	20300101	0.010	0.000	0.000	0.012	0.000	0.000
4703700060	Delek Logistics Operating, LLC	001	1	40400109	0.000	0.000	0.060	0.000	0.000	0.073
4703700060	Delek Logistics Operating, LLC	002	1	40400109	0.000	0.000	0.130	0.000	0.000	0.158
4703700060	Delek Logistics Operating, LLC	003	1	40400109	0.000	0.000	0.150	0.000	0.000	0.183
4703700060	Delek Logistics Operating, LLC	004	1	40400140	0.000	0.000	0.867	0.000	0.000	1.056
4703700060	Delek Logistics Operating, LLC	005	1	40400140	0.000	0.000	1.100	0.000	0.000	1.339
4703700060	Delek Logistics Operating, LLC	006	1	40400140	0.000	0.000	0.040	0.000	0.000	0.049
4703700060	Delek Logistics Operating, LLC	007	1	40400160	0.000	0.000	4.720	0.000	0.000	5.747
4703700060	Delek Logistics Operating, LLC	008	1	40600141	0.000	0.000	12.650	0.000	0.000	12.528
4703700060	Delek Logistics Operating, LLC	008	2	40400153	0.000	0.000	0.310	0.000	0.000	0.377
4703700060	Delek Logistics Operating, LLC	008	3	40400154	0.000	0.000	4.700	0.000	0.000	5.723
4703700060	Delek Logistics Operating, LLC	009	1	40400109	0.000	0.000	0.010	0.000	0.000	0.012
4703700061	Citgo Petroleum Corp.	001	1	40400140	0.000	0.000	2.989	0.000	0.000	3.639
4703700061	Citgo Petroleum Corp.	002	1	40400140	0.000	0.000	2.470	0.000	0.000	3.008
4703700061	Citgo Petroleum Corp.	003	1	40400160	0.000	0.000	2.625	0.000	0.000	3.196
4703700061	Citgo Petroleum Corp.	004	1	40400109	0.000	0.000	0.424	0.000	0.000	0.516
4703700061	Citgo Petroleum Corp.	005	1	40400109	0.000	0.000	0.022	0.000	0.000	0.027
4703700061	Citgo Petroleum Corp.	006	1	40400250	2.192	5.480	13.275	2.669	6.673	16.164
4703700061	Citgo Petroleum Corp.	006	2	40400153	0.000	0.000	0.080	0.000	0.000	0.097
4703700061	Citgo Petroleum Corp.	006	3	40400154	0.000	0.000	5.364	0.000	0.000	6.531
4703700061	Citgo Petroleum Corp.	008	1	40400109	0.000	0.000	0.020	0.000	0.000	0.024
4703700061	Citgo Petroleum Corp.	009	1	40400151	0.000	0.000	0.370	0.000	0.000	0.451
4703700061	Citgo Petroleum Corp.	010	1	40400151	0.000	0.000	1.126	0.000	0.000	1.371
4703700061	Citgo Petroleum Corp.	011	1	40400109	0.000	0.000	2.409	0.000	0.000	2.933
4703700062	Cumberland Terminals, Inc.	001	1	40400109	0.000	0.000	0.266	0.000	0.000	0.324
4703700062	Cumberland Terminals, Inc.	002	1	40400160	0.000	0.000	0.030	0.000	0.000	0.037
4703700062	Cumberland Terminals, Inc.	003	1	40400140	0.000	0.000	7.990	0.000	0.000	9.729
4703700062	Cumberland Terminals, Inc.	004	1	40400140	0.000	0.000	7.550	0.000	0.000	9.193
4703700062	Cumberland Terminals, Inc.	005	1	40400160	0.000	0.000	1.530	0.000	0.000	1.863
4703700062	Cumberland Terminals, Inc.	006	1	40400153	2.300	5.740	6.800	2.801	6.989	8.280
4703700062	Cumberland Terminals, Inc.	006	2	40400151	0.000	0.000	6.800	0.000	0.000	8.280
4703700062	Cumberland Terminals, Inc.	006	3	40400154	0.000	0.000	7.460	0.000	0.000	9.083
4703700062	Cumberland Terminals, Inc.	009	1	42500301	0.000	0.000	2.890	0.000	0.000	3.323
4703700064	Blanchard Terminal Company, LLC	001	1	40400109	0.000	0.000	0.780	0.000	0.000	0.950
4703700064	Blanchard Terminal Company, LLC	006	1	40400109	0.000	0.000	8.090	0.000	0.000	9.850
4703700064	Blanchard Terminal Company, LLC	010	1	40400153	0.000	0.000	3.810	0.000	0.000	4.639

4703700064	Blanchard Terminal Company, LLC	010	2	40400151	0.000	0.000	0.550	0.000	0.000	0.670
4703700064	Blanchard Terminal Company, LLC	010	3	40400154	0.000	0.000	15.130	0.000	0.000	18.422
4703700064	Blanchard Terminal Company, LLC	010	5	40400150	0.000	0.000	0.003	0.000	0.000	0.004
4703700064	Blanchard Terminal Company, LLC	010	6	40400150	0.000	0.000	0.080	0.000	0.000	0.097
4703700064	Blanchard Terminal Company, LLC	011	1	40400109	0.000	0.000	0.360	0.000	0.000	0.438
4703700064	Blanchard Terminal Company, LLC	013	1	40400199	0.000	0.000	0.410	0.000	0.000	0.499
4703700065	Shell Oil Products US	001	1	40400205	0.000	0.000	13.100	0.000	0.000	12.974
4703700065	Shell Oil Products US	002	1	40400205	0.000	0.000	1.730	0.000	0.000	1.713
4703700065	Shell Oil Products US	003	1	40400205	0.000	0.000	1.100	0.000	0.000	1.089
4703700065	Shell Oil Products US	008	1	40400250	0.230	0.570	6.710	0.280	0.694	8.170
4703700065	Shell Oil Products US	008	2	40400153	0.000	0.000	1.040	0.000	0.000	1.266
4703700065	Shell Oil Products US	008	3	40400154	0.000	0.000	14.030	0.000	0.000	17.083
4703700065	Shell Oil Products US	008	4	40400251	0.000	0.000	0.070	0.000	0.000	0.085
4703700065	Shell Oil Products US	009	1	40400109	0.000	0.000	0.004	0.000	0.000	0.005
4703700065	Shell Oil Products US	010	1	40400199	0.000	0.000	2.530	0.000	0.000	3.081
4703700065	Shell Oil Products US	011	1	40400122	0.000	0.000	0.770	0.000	0.000	0.938
4703700066	Magellan Terminals Holdings, LP	001	1	40400160	0.000	0.000	1.305	0.000	0.000	1.589
4703700066	Magellan Terminals Holdings, LP	002	1	40400160	0.000	0.000	0.380	0.000	0.000	0.463
4703700066	Magellan Terminals Holdings, LP	003	1	40400140	0.000	0.000	0.028	0.000	0.000	0.034
4703700066	Magellan Terminals Holdings, LP	004	1	40400160	0.000	0.000	2.670	0.000	0.000	3.251
4703700066	Magellan Terminals Holdings, LP	005	1	40400160	0.000	0.000	3.144	0.000	0.000	3.828
4703700066	Magellan Terminals Holdings, LP	006	1	40400109	0.000	0.000	3.854	0.000	0.000	4.693
4703700066	Magellan Terminals Holdings, LP	007	1	40400109	0.000	0.000	0.259	0.000	0.000	0.315
4703700066	Magellan Terminals Holdings, LP	010	1	40600145	4.460	11.150	16.920	5.431	13.576	20.602
4703700066	Magellan Terminals Holdings, LP	010	2	40400153	0.000	0.000	0.372	0.000	0.000	0.453
4703700066	Magellan Terminals Holdings, LP	010	3	40400154	0.000	0.000	0.695	0.000	0.000	0.846
4703700066	Magellan Terminals Holdings, LP	011	1	40400109	0.000	0.000	0.540	0.000	0.000	0.658
4703700066	Magellan Terminals Holdings, LP	012	1	40400109	0.000	0.000	0.537	0.000	0.000	0.654
4703700067	ExxonMobil Pipeline Corporation	004	1	40400160	0.000	0.000	10.186	0.000	0.000	12.403
4703700067	ExxonMobil Pipeline Corporation	007	1	40400109	0.000	0.000	0.271	0.000	0.000	0.330
4703700067	ExxonMobil Pipeline Corporation	024	1	40400150	0.000	0.000	28.213	0.000	0.000	34.352
4703700067	ExxonMobil Pipeline Corporation	024	3	40400154	0.000	0.000	10.479	0.000	0.000	12.759
4703700067	ExxonMobil Pipeline Corporation	025	1	40400109	0.000	0.000	0.037	0.000	0.000	0.045
4703700067	ExxonMobil Pipeline Corporation	027	1	40400163	0.000	0.000	0.044	0.000	0.000	0.054
4703700067	ExxonMobil Pipeline Corporation	028	1	40400151	0.000	0.000	1.295	0.000	0.000	1.577
4703700067	ExxonMobil Pipeline Corporation	999	1	40400151	2.810	6.761	0.284	3.421	8.232	0.346
4703700069	MPLX Terminals LLC - Bordeaux Terminal	001	1	40400109	0.000	0.000	0.970	0.000	0.000	1.181
4703700069	MPLX Terminals LLC - Bordeaux Terminal	006	1	40400160	0.000	0.000	18.650	0.000	0.000	22.708
4703700069	MPLX Terminals LLC - Bordeaux Terminal	010	1	40600145	0.000	0.000	15.380	0.000	0.000	18.727
4703700069	MPLX Terminals LLC - Bordeaux Terminal	010	2	40400153	0.000	0.000	1.550	0.000	0.000	1.887
4703700069	MPLX Terminals LLC - Bordeaux Terminal	010	3	40400154	0.000	0.000	10.680	0.000	0.000	13.004
4703700069	MPLX Terminals LLC - Bordeaux Terminal	011	1	40400108	0.000	0.000	0.750	0.000	0.000	0.913
4703700070	Magellan Terminals Holdings, L.P.	001	1	40400140	0.000	0.000	2.750	0.000	0.000	3.348
4703700070	Magellan Terminals Holdings, L.P.	003	1	40400121	0.000	0.000	0.334	0.000	0.000	0.407
4703700070	Magellan Terminals Holdings, L.P.	007	1	40400153	0.230	0.570	11.600	0.280	0.694	14.124
4703700070	Magellan Terminals Holdings, L.P.	007	2	40400151	0.000	0.000	0.288	0.000	0.000	0.351
4703700070	Magellan Terminals Holdings, L.P.	007	3	40400154	0.000	0.000	0.060	0.000	0.000	0.073

4703700070	Magellan Terminals Holdings, L.P.	008	1	40400109	0.000	0.000	0.858	0.000	0.000	1.045
4703700072	Warren Paint & Color Company	001	1	30101401	0.000	0.000	3.990	0.000	0.000	4.587
4703700076	Marathon Petroleum Company LP	001	1	40400109	0.000	0.000	2.130	0.000	0.000	2.594
4703700076	Marathon Petroleum Company LP	001	2	40400250	0.000	0.000	0.410	0.000	0.000	0.499
4703700076	Marathon Petroleum Company LP	002	1	30500206	2.100	1.750	0.110	2.670	2.225	0.140
4703700079	MPLX Terminals LLC - Nashville Terminal	003	1	40400170	0.000	0.000	5.870	0.000	0.000	7.147
4703700079	MPLX Terminals LLC - Nashville Terminal	008	1	40400316	0.000	0.000	0.500	0.000	0.000	0.565
4703700079	MPLX Terminals LLC - Nashville Terminal	009	1	40400250	0.000	0.000	1.660	0.000	0.000	2.021
4703700079	MPLX Terminals LLC - Nashville Terminal	009	2	40400153	0.000	0.000	0.760	0.000	0.000	0.925
4703700079	MPLX Terminals LLC - Nashville Terminal	009	3	40400154	0.000	0.000	5.410	0.000	0.000	6.587
4703700079	MPLX Terminals LLC - Nashville Terminal	011	1	40400109	0.000	0.000	0.120	0.000	0.000	0.146
4703700079	MPLX Terminals LLC - Nashville Terminal	012	1	40400109	0.000	0.000	0.580	0.000	0.000	0.706
4703700081	United States Tobacco Mfg, LP	002	1	30203399	0.000	0.000	3.370	0.000	0.000	3.792
4703700081	United States Tobacco Mfg, LP	002	3	30203399	0.000	0.000	32.430	0.000	0.000	36.489
4703700081	United States Tobacco Mfg, LP	002	4	30203399	1.087	0.913	0.060	1.223	1.027	0.068
4703700081	United States Tobacco Mfg, LP	003	2	30203399	0.000	0.000	0.005	0.000	0.000	0.006
4703700081	United States Tobacco Mfg, LP	003	3	30203399	0.000	0.000	0.010	0.000	0.000	0.011
4703700081	United States Tobacco Mfg, LP	004	1	30203399	0.000	0.000	0.014	0.000	0.000	0.016
4703700081	United States Tobacco Mfg, LP	006	1	20200107	0.034	0.008	0.001	0.040	0.009	0.001
4703700081	United States Tobacco Mfg, LP	006	2	20200107	0.256	0.070	0.004	0.299	0.082	0.005
4703700081	United States Tobacco Mfg, LP	009	1	10200602	0.329	0.167	0.092	0.391	0.198	0.109
4703700081	United States Tobacco Mfg, LP	009	2	10200502	0.003	0.001	0.000	0.003	0.001	0.000
4703700081	United States Tobacco Mfg, LP	009	3	10200602	1.350	0.684	0.378	1.603	0.812	0.449
4703700081	United States Tobacco Mfg, LP	009	4	10200502	0.002	0.001	0.000	0.002	0.001	0.000
4703700081	United States Tobacco Mfg, LP	009	5	10200602	0.713	0.367	0.081	0.847	0.436	0.096
4703700081	United States Tobacco Mfg, LP	010	2	30203399	0.000	0.000	0.070	0.000	0.000	0.079
4703700081	United States Tobacco Mfg, LP	010	3	30203399	0.000	0.000	0.017	0.000	0.000	0.019
4703700083	Lithographics, Inc.	001	1	40500403	0.000	0.000	0.950	0.000	0.000	1.066
4703700083	Lithographics, Inc.	001	2	40500403	0.000	0.000	4.200	0.000	0.000	4.713
4703700083	Lithographics, Inc.	001	3	40500403	0.000	0.000	0.003	0.000	0.000	0.003
4703700083	Lithographics, Inc.	001	4	40500403	0.000	0.000	0.160	0.000	0.000	0.180
4703700083	Lithographics, Inc.	002	1	40500403	1.730	1.730	0.001	1.941	1.941	0.001
4703700083	Lithographics, Inc.	002	2	40500403	0.000	0.000	0.510	0.000	0.000	0.572
4703700083	Lithographics, Inc.	002	3	40500403	0.000	0.000	0.064	0.000	0.000	0.072
4703700083	Lithographics, Inc.	002	4	40500403	0.000	0.000	0.012	0.000	0.000	0.013
4703700083	Lithographics, Inc.	003	2	40500403	0.000	0.000	1.930	0.000	0.000	2.166
4703700083	Lithographics, Inc.	003	3	40500403	0.000	0.000	0.104	0.000	0.000	0.117
4703700086	Falcon Press, LLC	001	1	40500403	0.000	0.000	0.726	0.000	0.000	0.815
4703700086	Falcon Press, LLC	001	2	40500403	0.000	0.000	2.243	0.000	0.000	2.516
4703700086	Falcon Press, LLC	001	3	40500403	0.000	0.000	0.006	0.000	0.000	0.006
4703700086	Falcon Press, LLC	001	4	40500403	0.000	0.000	0.394	0.000	0.000	0.442
4703700090	Embraer Aircraft Maint Services, Inc	001	1	40100399	0.000	0.000	0.011	0.000	0.000	0.013
4703700090	Embraer Aircraft Maint Services, Inc	002	3	40202406	0.000	0.000	0.215	0.000	0.000	0.264
4703700090	Embraer Aircraft Maint Services, Inc	002	4	40288801	0.000	0.000	0.084	0.000	0.000	0.117
4703700090	Embraer Aircraft Maint Services, Inc	002	5	40288824	0.000	0.000	6.468	0.000	0.000	9.013
4703700090	Embraer Aircraft Maint Services, Inc	004	1	20300101	0.032	0.007	0.003	0.040	0.009	0.004
4703700090	Embraer Aircraft Maint Services, Inc	004	2	20300101	0.086	0.019	0.007	0.107	0.024	0.009

4703700090	Embraer Aircraft Maint Services, Inc	005	1	20300101	0.117	0.025	0.010	0.146	0.031	0.012
4703700090	Embraer Aircraft Maint Services, Inc	005	2	20300101	0.162	0.035	0.013	0.202	0.044	0.016
4703700091	PSC Metals, LLC	005	1	30904600	0.280	0.550	0.000	0.358	0.703	0.000
4703700092	QG Printing II, LLC	001	1	40500403	4.780	4.020	45.850	5.364	4.511	51.452
4703700092	QG Printing II, LLC	001	3	40500403	0.000	0.000	14.690	0.000	0.000	16.485
4703700092	QG Printing II, LLC	002	1	40500403	0.000	0.000	0.004	0.000	0.000	0.004
4703700094	Saint Thomas Hospital West	001	1	10300602	7.310	6.140	0.400	9.181	7.711	0.502
4703700094	Saint Thomas Hospital West	001	2	10300502	0.020	0.000	0.000	0.025	0.000	0.000
4703700094	Saint Thomas Hospital West	003	1	20100102	4.830	0.950	0.110	2.613	0.514	0.060
4703700102	Colonial Pipeline Company	001	1	40400179	0.000	0.000	0.340	0.000	0.000	0.414
4703700102	Colonial Pipeline Company	001	3	40400151	0.000	0.000	0.910	0.000	0.000	1.108
4703700102	Colonial Pipeline Company	001	4	40400151	0.000	0.000	0.100	0.000	0.000	0.122
4703700102	Colonial Pipeline Company	001	5	40400162	0.000	0.000	0.560	0.000	0.000	0.682
4703700102	Colonial Pipeline Company	002	1	20100102	0.030	0.010	0.000	0.016	0.005	0.000
4703700110	CRT Custom Products, Inc.	001	1	40500403	0.000	0.000	0.462	0.000	0.000	0.518
4703700118	Southern Machinery Co	001	1	40202501	0.000	0.000	0.706	0.000	0.000	0.903
4703700126	Nashville Wire Products	001	1	40200801	0.580	0.480	0.030	0.808	0.669	0.042
4703700126	Nashville Wire Products	002	1	40200201	0.000	0.000	22.160	0.000	0.000	30.881
4703700127	United Cabinet Corporation	001	1	40201901	0.000	0.000	11.920	0.000	0.000	15.272
4703700127	United Cabinet Corporation	001	2	40201901	0.000	0.000	31.860	0.000	0.000	40.818
4703700127	United Cabinet Corporation	001	3	40201901	0.000	0.000	19.590	0.000	0.000	25.098
4703700127	United Cabinet Corporation	001	4	40201901	0.000	0.000	31.860	0.000	0.000	40.818
4703700128	Marcus Paint Company	001	1	30101401	0.000	0.000	8.740	0.000	0.000	10.048
4703700134	Rogers Manufacturing Co, Inc	001	1	40202537	0.000	0.000	3.400	0.000	0.000	4.346
4703700134	Rogers Manufacturing Co, Inc	001	2	40299998	0.000	0.000	0.820	0.000	0.000	1.143
4703700135	AmeriColor	001	3	40500403	0.000	0.000	3.770	0.000	0.000	4.231
4703700135	AmeriColor	001	4	40500403	0.000	0.000	0.390	0.000	0.000	0.438
4703700135	AmeriColor	001	6	40500403	0.000	0.000	1.010	0.000	0.000	1.133
4703700139	Hennessy Industries, Inc.	001	1	40200101	0.000	0.000	4.880	0.000	0.000	5.929
4703700139	Hennessy Industries, Inc.	002	1	40200801	1.120	0.940	0.060	1.561	1.310	0.084
4703700144	Wolfe Industrial, Inc.	001	1	40202501	0.000	0.000	0.440	0.000	0.000	0.562
4703700147	VA TN Valley Healthcare Systen	001	1	10200602	5.090	4.280	0.280	6.045	5.083	0.333
4703700147	VA TN Valley Healthcare Systen	001	2	10200502	0.073	0.002	0.001	0.085	0.002	0.001
4703700147	VA TN Valley Healthcare Systen	002	1	31502001	0.000	0.000	0.023	0.000	0.000	0.036
4703700147	VA TN Valley Healthcare Systen	003	1	20100107	0.113	0.366	0.237	0.061	0.198	0.128
4703700149	Cliff's Cabinet Company	001	1	40201901	0.000	0.000	3.160	0.000	0.000	4.049
4703700149	Cliff's Cabinet Company	001	2	40200901	0.000	0.000	0.880	0.000	0.000	1.226
4703700149	Cliff's Cabinet Company	001	3	40200701	0.000	0.000	0.030	0.000	0.000	0.037
4703700156	Gibson USA	001	1	40200101	0.000	0.000	57.490	0.000	0.000	69.846
4703700159	Creative Cabinetry Solutions, Inc.	001	2	40288801	0.000	0.000	2.040	0.000	0.000	2.843
4703700160	Marshall & Bruce Company	001	1	40500403	0.000	0.000	4.500	0.000	0.000	5.050
4703700160	Marshall & Bruce Company	001	2	40500403	0.000	0.000	1.010	0.000	0.000	1.133
4703700160	Marshall & Bruce Company	001	4	40500403	0.000	0.000	0.520	0.000	0.000	0.584
4703700160	Marshall & Bruce Company	001	5	40500403	0.000	0.000	0.240	0.000	0.000	0.269
4703700163	Skyline Madison Campus	001	1	10300602	1.275	1.071	0.070	1.601	1.345	0.088
4703700163	Skyline Madison Campus	001	2	10300501	0.004	0.005	0.001	0.005	0.006	0.001
4703700163	Skyline Madison Campus	003	1	20100107	1.536	0.347	0.064	0.831	0.188	0.035

4703700164	Vulcan Construction Materials, LP	001	1	30500205	1.480	23.730	0.490	1.672	26.816	0.554
4703700164	Vulcan Construction Materials, LP	003	1	30500205	0.000	0.360	2.360	0.000	0.407	2.667
4703700169	Ambrose Printing Co.	003	1	40500403	0.000	0.000	0.770	0.000	0.000	0.864
4703700169	Ambrose Printing Co.	004	1	40500403	0.130	0.110	0.073	0.146	0.123	0.082
4703700169	Ambrose Printing Co.	004	2	40500403	0.000	0.000	0.470	0.000	0.000	0.527
4703700174	Fiserv - Nashville	002	1	40500403	0.000	0.000	3.071	0.000	0.000	3.446
4703700174	Fiserv - Nashville	003	1	40500403	0.000	0.000	4.090	0.000	0.000	4.590
4703700176	Superior Trim	003	1	33088801	0.000	0.000	2.290	0.000	0.000	1.809
4703700179	Commercial Laminations, Inc.	001	1	40201901	0.000	0.000	2.680	0.000	0.000	3.434
4703700179	Commercial Laminations, Inc.	001	2	40299998	0.000	0.000	0.510	0.000	0.000	0.711
4703700179	Commercial Laminations, Inc.	002	1	40288801	0.000	0.000	0.570	0.000	0.000	0.794
4703700179	Commercial Laminations, Inc.	002	2	40299998	0.000	0.000	0.450	0.000	0.000	0.627
4703700179	Commercial Laminations, Inc.	003	1	40288801	0.000	0.000	0.400	0.000	0.000	0.557
4703700179	Commercial Laminations, Inc.	003	2	40299998	0.000	0.000	0.140	0.000	0.000	0.195
4703700179	Commercial Laminations, Inc.	004	1	40299998	0.000	0.000	0.340	0.000	0.000	0.474
4703700186	Servitech Industries, Inc.	001	1	40202501	0.000	0.000	0.313	0.000	0.000	0.400
4703700186	Servitech Industries, Inc.	003	1	40202533	0.000	0.000	0.847	0.000	0.000	1.083
4703700186	Servitech Industries, Inc.	004	1	40288801	0.000	0.000	0.247	0.000	0.000	0.344
4703700186	Servitech Industries, Inc.	005	1	40200801	1.275	1.071	0.070	1.777	1.492	0.098
4703700186	Servitech Industries, Inc.	006	1	40201403	0.000	0.000	0.002	0.000	0.000	0.003
4703700188	Dixie Graphics	001	1	40500403	0.000	0.000	9.830	0.000	0.000	11.031
4703700188	Dixie Graphics	002	1	40500403	0.000	0.000	0.010	0.000	0.000	0.011
4703700188	Dixie Graphics	005	1	40200101	0.000	0.000	2.270	0.000	0.000	2.758
4703700189	Dept. of Public Works Bordeaux Landfill	001	1	50100402	0.000	0.186	0.501	0.000	0.232	0.623
4703700189	Dept. of Public Works Bordeaux Landfill	001	2	50100410	0.780	14.341	0.030	0.780	14.341	0.030
4703700191	Ergon Asphalt & Emulsions, Inc.	002	1	40400199	0.000	0.000	0.700	0.000	0.000	0.852
4703700191	Ergon Asphalt & Emulsions, Inc.	002	3	30500206	0.032	0.027	0.002	0.041	0.034	0.003
4703700191	Ergon Asphalt & Emulsions, Inc.	003	1	40400103	0.000	0.000	0.085	0.000	0.000	0.103
4703700196	Fiberweb, Inc. (A Berry Global Company)	008	1	10200602	6.090	5.120	0.330	7.233	6.081	0.392
4703700196	Fiberweb, Inc. (A Berry Global Company)	010	2	40500403	0.350	0.290	0.020	0.393	0.325	0.022
4703700196	Fiberweb, Inc. (A Berry Global Company)	012	1	30101809	0.000	0.000	0.020	0.000	0.000	0.027
4703700196	Fiberweb, Inc. (A Berry Global Company)	013	1	10200603	0.780	0.790	0.110	0.926	0.938	0.131
4703700196	Fiberweb, Inc. (A Berry Global Company)	014	1	10200601	26.240	54.660	3.930	31.165	64.920	4.668
4703700196	Fiberweb, Inc. (A Berry Global Company)	015	1	20200102	0.010	0.010	0.000	0.012	0.012	0.000
4703700197	Magnetic Ticket & Label Corp.	002	2	40500403	0.004	0.002	0.000	0.004	0.002	0.000
4703700197	Magnetic Ticket & Label Corp.	011	1	40500403	0.000	0.000	0.005	0.000	0.000	0.006
4703700197	Magnetic Ticket & Label Corp.	015	2	40204435	0.000	0.000	0.001	0.000	0.000	0.001
4703700197	Magnetic Ticket & Label Corp.	016	1	40288801	0.000	0.000	0.048	0.000	0.000	0.067
4703700197	Magnetic Ticket & Label Corp.	016	2	40288801	0.000	0.000	3.154	0.000	0.000	4.395
4703700197	Magnetic Ticket & Label Corp.	016	3	40288801	0.000	0.000	0.070	0.000	0.000	0.098
4703700198	Summit Medical Center	001	1	10300602	1.760	1.550	0.170	2.210	1.947	0.214
4703700198	Summit Medical Center	001	2	10300501	0.050	0.010	0.020	0.062	0.012	0.025
4703700198	Summit Medical Center	002	1	10300603	0.490	0.740	0.080	0.615	0.929	0.100
4703700198	Summit Medical Center	003	1	20100107	0.270	0.060	0.010	0.146	0.032	0.005
4703700200	BNA Fuel Company LLC	001	1	40301016	0.000	0.000	1.360	0.000	0.000	1.656
4703700200	BNA Fuel Company LLC	002	1	40301016	0.000	0.000	1.150	0.000	0.000	1.400
4703700200	BNA Fuel Company LLC	003	1	40301016	0.000	0.000	0.480	0.000	0.000	0.584

4703700200	BNA Fuel Company LLC	004	1	40301016	0.000	0.000	0.420	0.000	0.000	0.511
4703700200	BNA Fuel Company LLC	005	1	20300101	0.090	0.020	0.000	0.112	0.025	0.000
4703700203	Davis Cabinet Company	001	1	40201901	0.000	0.000	0.541	0.000	0.000	0.693
4703700203	Davis Cabinet Company	002	1	40288824	0.000	0.000	0.133	0.000	0.000	0.185
4703700204	Jones Bros. Contractors, LLC	001	1	30500205	2.636	13.182	3.245	2.979	14.896	3.667
4703700204	Jones Bros. Contractors, LLC	005	1	30500203	0.000	0.617	4.034	0.000	0.697	4.559
4703700208	Vulcan Construction Materials, LP	001	1	30500205	2.885	14.425	3.551	3.260	16.301	4.013
4703700208	Vulcan Construction Materials, LP	001	3	30500213	0.000	0.281	1.814	0.000	0.318	2.050
4703700208	Vulcan Construction Materials, LP	005	2	20200102	0.143	0.031	0.011	0.167	0.036	0.013
4703700208	Vulcan Construction Materials, LP	008	4	20200107	0.373	0.008	0.003	0.435	0.009	0.003
4703700209	Trailer Conditioners, Inc.	001	1	40202501	0.000	0.000	0.238	0.000	0.000	0.304
4703700209	Trailer Conditioners, Inc.	002	1	40202501	0.000	0.000	0.366	0.000	0.000	0.468
4703700211	NEXEO Solutions, LLC	001	1	40899995	0.000	0.000	0.260	0.000	0.000	0.299
4703700211	NEXEO Solutions, LLC	001	2	40899995	0.000	0.000	4.200	0.000	0.000	4.829
4703700211	NEXEO Solutions, LLC	002	1	40899999	0.000	0.000	0.020	0.000	0.000	0.023
4703700211	NEXEO Solutions, LLC	004	1	40799999	0.000	0.000	0.060	0.000	0.000	0.069
4703700211	NEXEO Solutions, LLC	005	1	40799999	0.000	0.000	1.030	0.000	0.000	1.184
4703700213	Trew Industrial Wheels, Inc.	002	1	30800704	0.000	0.000	1.570	0.000	0.000	2.153
4703700213	Trew Industrial Wheels, Inc.	004	1	40200101	0.000	0.000	0.460	0.000	0.000	0.559
4703700217	Reading Midwest Distribution, LLC	001	1	40200101	0.000	0.000	0.005	0.000	0.000	0.006
4703700220	Rogers Group, Inc.	001	1	30500240	4.885	16.280	0.330	5.520	18.397	0.373
4703700220	Rogers Group, Inc.	002	3	30500214	0.000	0.250	1.600	0.000	0.283	1.808
4703700232	Lellyett & Rogers Company	001	1	40500403	0.000	0.000	0.283	0.000	0.000	0.318
4703700232	Lellyett & Rogers Company	001	2	40500403	0.000	0.000	0.015	0.000	0.000	0.017
4703700232	Lellyett & Rogers Company	001	3	40500403	0.000	0.000	0.017	0.000	0.000	0.019
4703700236	Purity Dairies, Inc.	001	1	10300602	3.050	0.760	0.120	3.831	0.955	0.151
4703700237	Cumberland Architectural Millwork, Inc.	001	1	40200701	0.000	0.000	0.527	0.000	0.000	0.648
4703700237	Cumberland Architectural Millwork, Inc.	002	1	40200101	0.000	0.000	4.520	0.000	0.000	5.491
4703700240	Precision Fabrics Group, Inc.	001	1	40201001	3.390	2.840	0.190	4.026	3.373	0.226
4703700240	Precision Fabrics Group, Inc.	002	1	40204340	0.100	0.090	0.010	0.108	0.097	0.011
4703700240	Precision Fabrics Group, Inc.	003	1	40204421	0.000	0.000	4.890	0.000	0.000	5.271
4703700240	Precision Fabrics Group, Inc.	004	1	10300603	0.160	0.130	0.010	0.201	0.163	0.013
4703700241	Vanderbilt University Medical Center	001	1	10100501	2.000	0.700	0.077	1.082	0.379	0.042
4703700242	Frontier Logistical Services, LLC	001	1	40899995	0.000	0.000	4.010	0.000	0.000	4.610
4703700242	Frontier Logistical Services, LLC	002	1	40899995	0.000	0.000	3.617	0.000	0.000	4.158
4703700242	Frontier Logistical Services, LLC	003	1	40799999	0.000	0.000	0.124	0.000	0.000	0.143
4703700242	Frontier Logistical Services, LLC	004	1	40799999	0.000	0.000	5.068	0.000	0.000	5.826
4703700244	Tristar Centennial Medical Center	001	1	10300602	6.790	5.700	0.370	8.528	7.159	0.465
4703700244	Tristar Centennial Medical Center	001	2	10300502	0.050	0.010	0.001	0.062	0.012	0.001
4703700244	Tristar Centennial Medical Center	002	2	20100102	5.140	1.020	0.170	2.781	0.552	0.092
4703700250	Vanderbilt University Printing Services	001	1	40500403	0.000	0.000	0.090	0.000	0.000	0.101
4703700250	Vanderbilt University Printing Services	001	2	40500403	0.000	0.000	0.928	0.000	0.000	1.041
4703700250	Vanderbilt University Printing Services	001	3	40500403	0.000	0.000	0.032	0.000	0.000	0.036
4703700251	R.J. Wherry and Associates, Inc.	001	1	40200401	0.000	0.000	0.077	0.000	0.000	0.107
4703700251	R.J. Wherry and Associates, Inc.	001	2	40200101	0.000	0.000	0.099	0.000	0.000	0.120
4703700251	R.J. Wherry and Associates, Inc.	001	3	40200601	0.000	0.000	0.045	0.000	0.000	0.056
4703700251	R.J. Wherry and Associates, Inc.	001	4	40200101	0.000	0.000	0.734	0.000	0.000	0.891

4703700251	R.J. Wherry and Associates, Inc.	001	6	40200701	0.000	0.000	2.277	0.000	0.000	2.801
4703700251	R.J. Wherry and Associates, Inc.	001	7	40200901	0.000	0.000	0.896	0.000	0.000	1.248
4703700260	Pollock Printing Company, Inc.	001	1	40500403	0.310	0.260	0.130	0.348	0.292	0.146
4703700260	Pollock Printing Company, Inc.	002	1	40500403	0.000	0.000	4.440	0.000	0.000	4.982
4703700262	CEMEX, Inc.	007	1	20200102	12.130	0.780	0.290	14.152	0.910	0.338
4703700262	CEMEX, Inc.	007	2	20200102	5.780	1.240	0.460	6.743	1.447	0.537
4703700264	Atlantic Aviation	001	1	40688801	0.000	0.000	0.010	0.000	0.000	0.012
4703700264	Atlantic Aviation	001	2	40688801	0.000	0.000	1.544	0.000	0.000	1.880
4703700268	K.R. Harrington Water Plant	001	1	20100102	22.106	3.396	0.788	11.959	1.837	0.427
4703700268	K.R. Harrington Water Plant	002	1	40400316	0.000	0.000	0.005	0.000	0.000	0.005
4703700272	Alternative Energy, LLC	009	1	20200107	2.750	0.627	0.112	3.208	0.731	0.131
4703700272	Alternative Energy, LLC	010	1	20200107	8.030	0.651	0.093	9.368	0.759	0.108
4703700274	Ace Cleaners	001	1	40100104	0.000	0.000	0.140	0.000	0.000	0.179
4703700276	The Mulch Company, LLC	002	1	20200107	14.480	3.110	1.170	16.893	3.628	1.365
4703700277	Tyson Fresh Meats, Inc.	001	1	10500206	0.970	0.810	0.040	1.218	1.017	0.050
4703700277	Tyson Fresh Meats, Inc.	002	1	20100102	0.020	0.000	0.000	0.011	0.000	0.000
4703700279	ARAMARK Uniform Services	001	1	10300602	0.340	0.290	0.020	0.427	0.364	0.025
4703700279	ARAMARK Uniform Services	002	1	39000699	1.320	1.110	0.070	1.568	1.318	0.083
4703700288	Snider Fleet Solutions	001	1	30800501	0.000	0.000	0.110	0.000	0.000	0.151
4703700288	Snider Fleet Solutions	001	2	30800101	0.000	0.000	0.880	0.000	0.000	1.207
4703700288	Snider Fleet Solutions	001	3	30800501	0.000	0.000	0.020	0.000	0.000	0.027
4703700290	AZZ Galvanizing - Nashville	003	1	39000699	1.620	1.360	0.090	1.924	1.615	0.107
4703700293	Marangoni Tread, N.A., Inc.	002	1	30800105	0.000	0.000	0.920	0.000	0.000	1.261
4703700293	Marangoni Tread, N.A., Inc.	002	2	30800199	0.040	0.070	0.000	0.055	0.096	0.000
4703700293	Marangoni Tread, N.A., Inc.	003	1	10200603	1.210	0.610	0.072	1.437	0.724	0.086
4703700294	Berry Film Products Company, Inc.	001	1	40500403	0.350	0.300	0.020	0.393	0.337	0.022
4703700294	Berry Film Products Company, Inc.	001	2	40500403	0.000	0.000	3.840	0.000	0.000	4.309
4703700294	Berry Film Products Company, Inc.	001	3	40500403	0.000	0.000	6.710	0.000	0.000	7.530
4703700294	Berry Film Products Company, Inc.	002	1	40500403	0.560	0.470	0.030	0.628	0.527	0.034
4703700294	Berry Film Products Company, Inc.	002	2	40500403	0.000	0.000	6.080	0.000	0.000	6.823
4703700294	Berry Film Products Company, Inc.	002	3	40500403	0.000	0.000	10.630	0.000	0.000	11.929
4703700294	Berry Film Products Company, Inc.	003	1	40500403	0.000	0.000	0.233	0.000	0.000	0.261
4703700294	Berry Film Products Company, Inc.	003	2	40500403	0.000	0.000	1.590	0.000	0.000	1.784
4703700294	Berry Film Products Company, Inc.	004	1	40500403	0.000	0.000	0.080	0.000	0.000	0.090
4703700294	Berry Film Products Company, Inc.	005	1	40500403	0.000	0.000	0.018	0.000	0.000	0.020
4703700294	Berry Film Products Company, Inc.	006	1	40500403	0.000	0.000	0.010	0.000	0.000	0.011
4703700294	Berry Film Products Company, Inc.	007	1	40500403	0.000	0.000	0.052	0.000	0.000	0.058
4703700294	Berry Film Products Company, Inc.	007	2	40500403	0.000	0.000	0.002	0.000	0.000	0.002
4703700294	Berry Film Products Company, Inc.	008	1	40500403	0.650	0.540	0.035	0.729	0.606	0.039
4703700294	Berry Film Products Company, Inc.	008	2	40500403	0.000	0.000	7.040	0.000	0.000	7.900
4703700294	Berry Film Products Company, Inc.	008	3	40500403	0.000	0.000	12.300	0.000	0.000	13.803
4703700294	Berry Film Products Company, Inc.	009	1	40500403	0.000	0.000	0.340	0.000	0.000	0.382
4703700295	Metropolitan Nashville Airport Authority	001	1	10300602	2.112	1.774	0.116	2.653	2.228	0.146
4703700295	Metropolitan Nashville Airport Authority	002	1	20100107	3.460	0.780	0.130	1.872	0.422	0.070
4703700297	Stone Bridge Cleaners	001	1	41000244	0.000	0.000	0.032	0.000	0.000	0.041
4703700299	Healthcare Realty Services, Inc.	001	1	10300602	1.780	1.500	0.100	2.236	1.884	0.126
4703700299	Healthcare Realty Services, Inc.	002	1	20200102	0.242	0.056	0.007	0.283	0.065	0.008

4703700302	Waste Management of Nashville	014	1	40202520	0.000	0.000	0.840	0.000	0.000	1.074
4703700303	Nashville Bun Company	001	1	30203202	0.000	0.000	2.243	0.000	0.000	2.717
4703700303	Nashville Bun Company	001	2	30203202	0.833	0.700	0.000	1.009	0.848	0.000
4703700303	Nashville Bun Company	002	1	30203202	0.702	0.590	0.039	0.850	0.715	0.047
4703700305	Southern Recycling, LLC	001	1	31401101	0.012	0.000	0.000	0.015	0.000	0.000
4703700309	Nashville Custom Woodwork, Inc.	001	1	40200101	0.000	0.000	0.917	0.000	0.000	1.114
4703700312	Young's Cleaners	001	1	40100102	0.000	0.000	0.005	0.000	0.000	0.006
4703700313	Piedmont Natural Gas	001	1	10200601	0.970	0.705	0.071	1.152	0.837	0.084
4703700313	Piedmont Natural Gas	002	1	20200101	0.003	0.001	0.000	0.004	0.001	0.000
4703700314	Thorntons, Inc.	001	1	40600499	0.000	0.000	0.293	0.000	0.000	0.290
4703700314	Thorntons, Inc.	001	2	40600499	0.000	0.000	0.017	0.000	0.000	0.017
4703700316	CHEP Recycled Pallet Solutions, LLC	001	1	20200102	14.900	3.214	1.208	17.383	3.750	1.409
4703700317	Millwood, Inc.	001	1	40288821	0.000	0.000	0.166	0.000	0.000	0.231
4703700317	Millwood, Inc.	002	1	40288821	0.000	0.000	0.034	0.000	0.000	0.047
4703700318	E & M Cleaners $1.98	001	1	40100102	0.000	0.000	0.177	0.000	0.000	0.226
4703700319	TriStar Transport, LLC	001	1	40400150	0.000	0.000	1.364	0.000	0.000	1.661
4703700319	TriStar Transport, LLC	001	2	40400154	0.000	0.000	1.364	0.000	0.000	1.661
4703700320	D&P Custom Lights and Products, Inc.	001	1	40202501	0.000	0.000	0.335	0.000	0.000	0.428
4703700322	TRANSFLO Terminal Services, Inc.	001	1	40899999	0.000	0.000	0.010	0.000	0.000	0.011
4703700322	TRANSFLO Terminal Services, Inc.	002	1	10200503	0.030	0.010	0.000	0.035	0.012	0.000
4703700323	Belmont University	001	1	10300602	4.080	3.430	0.220	5.124	4.308	0.276
4703700323	Belmont University	002	1	20100102	2.680	0.660	0.130	1.450	0.357	0.070
4703700324	Lipscomb University	001	1	10300602	2.590	2.200	0.140	3.253	2.763	0.176
4703700324	Lipscomb University	002	1	20100102	1.700	0.330	0.120	0.920	0.179	0.065
4703700325	Serra Chevrolet-Buick-GMC	001	1	40201606	0.000	0.000	1.490	0.000	0.000	1.994
4703700328	Fisk University	001	1	10300602	0.910	0.760	0.050	1.143	0.955	0.063
4703700328	Fisk University	002	1	20100202	0.002	0.044	0.012	0.005	0.111	0.031
4703700329	Maaco Collision Center	001	1	40201601	0.000	0.000	1.990	0.000	0.000	2.663
4703700330	Skyline Medical Center	001	1	10300602	2.996	0.449	0.120	3.763	0.564	0.151
4703700330	Skyline Medical Center	001	2	10300502	0.006	0.002	0.000	0.007	0.002	0.000
4703700330	Skyline Medical Center	002	1	20100102	0.627	0.144	0.017	0.339	0.078	0.009
4703700331	Service King Paint & Body, LLC	001	1	40201601	0.000	0.000	1.150	0.000	0.000	1.539
4703700332	Childress Collision Center	001	1	40201601	0.000	0.000	2.080	0.000	0.000	2.784
4703700333	Service King Paint & Body, LLC	001	1	40201601	0.000	0.000	0.190	0.000	0.000	0.254
4703700335	Advanced Composites, Inc.	002	1	30101821	0.000	0.000	7.550	0.000	0.000	10.352
4703700335	Advanced Composites, Inc.	004	1	30101821	0.000	0.000	0.020	0.000	0.000	0.027
4703700335	Advanced Composites, Inc.	005	1	30890013	0.060	0.050	0.000	0.075	0.062	0.000
4703700339	Maaco Auto Painting	001	1	40201601	0.000	0.000	1.860	0.000	0.000	2.489
4703700341	Superior Oil Company, Inc.	001	1	40714697	0.000	0.000	1.248	0.000	0.000	1.435
4703700341	Superior Oil Company, Inc.	002	1	40899999	0.000	0.000	0.265	0.000	0.000	0.305
4703700341	Superior Oil Company, Inc.	002	2	40899999	0.000	0.000	0.767	0.000	0.000	0.882
4703700341	Superior Oil Company, Inc.	002	3	40799999	0.000	0.000	0.839	0.000	0.000	0.965
4703700341	Superior Oil Company, Inc.	002	4	40799999	0.000	0.000	3.100	0.000	0.000	3.564
4703700341	Superior Oil Company, Inc.	002	5	49000499	0.000	0.000	0.150	0.000	0.000	0.208
4703700345	Econo Auto Painting	001	1	40201699	0.000	0.000	3.790	0.000	0.000	5.072
4703700346	Vietti Foods, Inc.	001	1	10300602	13.320	11.190	0.720	16.729	14.054	0.904
4703700347	Sonic Automotive - Crest Cadillac	001	1	40201699	0.000	0.000	1.095	0.000	0.000	1.465

4703700348	3M Company	001	2	33000199	0.000	0.000	0.050	0.000	0.000	0.039
4703700348	3M Company	001	3	33000199	0.000	0.000	0.070	0.000	0.000	0.055
4703700348	3M Company	001	4	33000199	0.000	0.000	0.130	0.000	0.000	0.103
4703700348	3M Company	003	1	40188801	0.000	0.000	0.620	0.000	0.000	0.754
4703700348	3M Company	003	2	10200602	0.890	0.750	0.050	1.057	0.891	0.059
4703700348	3M Company	004	1	20300207	0.010	0.010	0.000	0.013	0.013	0.000
4703700349	ADESA Nashville	001	1	40201601	0.000	0.000	0.100	0.000	0.000	0.134
4703700349	ADESA Nashville	001	2	40201601	0.000	0.000	0.730	0.000	0.000	0.977
4703700349	ADESA Nashville	001	3	40201605	0.000	0.000	0.030	0.000	0.000	0.040
4703700350	CarMax Auto Superstores, Inc.	001	1	40201601	0.000	0.000	2.970	0.000	0.000	3.975
4703700351	American Farms	001	2	20300101	1.180	0.360	0.020	1.475	0.450	0.025
4703700351	American Farms	003	4	20300101	0.030	0.010	0.000	0.037	0.012	0.000
4703700351	American Farms	004	4	20300101	0.240	0.010	0.000	0.300	0.012	0.000
4703700352	Waste Management of Tennessee - MTEC	003	1	20200102	0.419	0.229	0.028	0.489	0.267	0.033
4703700353	VUMC - Case Cart Operations Center	001	1	31502001	0.000	0.000	0.010	0.000	0.000	0.016
4703700353	VUMC - Case Cart Operations Center	002	1	20200102	0.010	0.010	0.000	0.012	0.012	0.000
4703700354	C&J Mulch, Inc.	001	1	20200102	1.049	0.162	0.031	1.224	0.189	0.036
4703700355	Service King Paint & Body, LLC	001	1	40200210	0.000	0.000	0.290	0.000	0.000	0.404
4703700356	CarMax Auto Superstores, Inc.	001	1	40200101	0.000	0.000	2.180	0.000	0.000	2.649
4703700357	Action Nissan Body Shop	001	1	40201625	0.000	0.000	0.120	0.000	0.000	0.161
4703700358	Bank of New York Mellon	001	1	20300101	3.920	0.300	0.060	4.900	0.375	0.075
4703700358	Bank of New York Mellon	001	2	20300101	0.050	0.010	0.000	0.062	0.012	0.000
4703700358	Bank of New York Mellon	001	3	20300101	3.240	0.700	0.140	4.050	0.875	0.175
4703700359	ABRA Auto Body & Glass - Madison	001	1	40201601	0.000	0.000	1.900	0.000	0.000	2.543
4703700360	LBA REIT V, L.P.	001	1	20100102	0.210	0.032	0.010	0.114	0.017	0.005
4703700361	UBS AG	001	1	20200102	0.660	0.070	0.018	0.770	0.082	0.021
4703700362	American Appliance Products, Inc.	001	1	10200602	1.600	1.340	0.090	1.900	1.592	0.107
4703700364	Service King Paint & Body, LLC	001	1	40201620	0.000	0.000	0.170	0.000	0.000	0.228
4703700365	Harpeth Valley Utilities District	001	1	20100102	2.983	1.345	0.318	1.614	0.728	0.172
4703700365	Harpeth Valley Utilities District	001	2	20100102	2.877	1.297	0.307	1.556	0.702	0.166
4703700365	Harpeth Valley Utilities District	001	3	20100102	0.241	0.055	0.007	0.130	0.030	0.004
4703700366	HCA IT&S	001	1	20100102	2.714	0.622	0.080	1.468	0.337	0.043
4703700367	Skyway Studios Enterprises, LLC	001	1	20100102	0.820	0.160	0.010	0.444	0.087	0.005
4703700367	Skyway Studios Enterprises, LLC	001	2	20100102	0.820	0.160	0.010	0.444	0.087	0.005
4703700367	Skyway Studios Enterprises, LLC	001	3	20100102	0.160	0.030	0.010	0.087	0.016	0.005
4703700368	Change Healthcare	001	1	20100102	0.043	0.081	0.002	0.023	0.044	0.001
4703700369	Regions Financial Corporation	001	1	20100102	2.540	0.220	0.080	1.374	0.119	0.043
4703700370	Dollar General Corporation	001	1	20300101	0.120	0.030	0.000	0.150	0.037	0.000
4703700370	Dollar General Corporation	001	2	20300101	0.320	0.070	0.010	0.400	0.087	0.012
4703700370	Dollar General Corporation	001	3	20300101	0.310	0.070	0.010	0.387	0.087	0.012
4703700370	Dollar General Corporation	001	4	20300101	0.120	0.030	0.000	0.150	0.037	0.000
4703700370	Dollar General Corporation	001	5	20300101	0.050	0.010	0.000	0.062	0.012	0.000
4703700370	Dollar General Corporation	001	6	20300101	0.050	0.010	0.000	0.062	0.012	0.000
4703700371	vXchnge-Facilities, LLC	001	1	20100102	0.307	0.030	0.008	0.166	0.016	0.004
4703700372	Music City Center	001	1	20100102	0.280	0.050	0.020	0.151	0.027	0.011
4703700372	Music City Center	001	2	20100102	0.320	0.050	0.020	0.173	0.027	0.011
4703700373	Nippers Corner Cleaners	001	1	41000202	0.000	0.000	0.096	0.000	0.000	0.123

4703700374	Republic Services, Inc.	001	1	40202501	0.000	0.000	0.840	0.000	0.000	1.074
4703700374	Republic Services, Inc.	001	2	40201001	0.040	0.030	0.000	0.048	0.036	0.000
4703700375	Cumberland Stadium, Inc.	001	1	20100102	0.990	0.070	0.030	0.536	0.038	0.016
4703700376	ALSCO, Inc.	001	1	10200602	0.780	0.750	0.010	0.926	0.891	0.012
4703700376	ALSCO, Inc.	001	2	10200502	0.010	0.000	0.000	0.012	0.000	0.000
4703700377	Powers Management, LLC	001	1	20100102	0.604	0.025	0.010	0.327	0.013	0.005
4703700378	Service King Collision Repair Center	001	1	40201621	0.000	0.000	0.149	0.000	0.000	0.199
4703700378	Service King Collision Repair Center	001	3	40201602	0.000	0.000	0.095	0.000	0.000	0.127
4703700378	Service King Collision Repair Center	001	4	40201603	0.000	0.000	0.005	0.000	0.000	0.007
4703700379	HCA Holdings, Inc.	001	1	20100102	0.281	0.060	0.023	0.152	0.032	0.012
4703700379	HCA Holdings, Inc.	001	2	20100102	1.950	1.130	0.057	1.055	0.611	0.031
4703700380	Allen Printing Company	001	1	40500403	0.000	0.000	2.860	0.000	0.000	3.209
4703700381	Kennametal, Inc.	001	1	40100398	0.000	0.000	1.440	0.000	0.000	1.752
4703700381	Kennametal, Inc.	003	1	40100295	0.000	0.000	1.180	0.000	0.000	1.436
4703700381	Kennametal, Inc.	007	1	30402201	0.000	0.016	0.002	0.000	0.018	0.002
4703700381	Kennametal, Inc.	009	1	20100102	0.250	0.053	0.020	0.135	0.029	0.011
4703700382	MidSouth Wire	001	1	30900199	2.660	2.240	0.150	3.400	2.864	0.192
4703700382	MidSouth Wire	002	1	30900199	2.660	2.240	0.150	3.400	2.864	0.192
4703700383	Deloitte Services LP	001	1	20100102	0.215	0.012	0.000	0.116	0.006	0.000
4703700383	Deloitte Services LP	001	2	20100102	0.193	0.011	0.001	0.104	0.006	0.001
4703700383	Deloitte Services LP	001	3	20100102	0.262	0.014	0.001	0.142	0.008	0.001
4703700383	Deloitte Services LP	001	4	20100102	0.876	0.124	0.001	0.474	0.067	0.001
4703700383	Deloitte Services LP	001	5	20100102	0.840	0.119	0.001	0.454	0.064	0.001
4703700383	Deloitte Services LP	001	6	20100102	0.840	0.119	0.001	0.454	0.064	0.001
4703700384	Willis North America, Inc.	001	1	20300101	0.608	0.207	0.027	0.760	0.259	0.034
4703700385	T-Mobile USA	001	1	20300101	2.980	0.410	0.080	3.725	0.512	0.100
4703700389	Caremark, LLC	001	1	20300101	0.550	0.050	0.030	0.687	0.062	0.037
4703700389	Caremark, LLC	001	2	20300101	0.320	0.030	0.010	0.400	0.037	0.012
4703700390	Caterpillar Financial Services Corp.	001	1	20300101	0.111	0.016	0.003	0.139	0.020	0.004
4703700390	Caterpillar Financial Services Corp.	001	2	20300101	0.166	0.024	0.004	0.207	0.030	0.005
4703700391	UniFirst Corporation	001	7	33000106	0.000	0.000	2.700	0.000	0.000	2.132
4703700391	UniFirst Corporation	001	1	10200603	0.450	0.380	0.020	0.534	0.451	0.024
4703700391	UniFirst Corporation	001	2	39000699	0.040	0.030	0.000	0.048	0.036	0.000
4703700391	UniFirst Corporation	001	3	39000699	0.450	0.370	0.020	0.534	0.439	0.024
4703700391	UniFirst Corporation	001	4	10500106	0.040	0.030	0.000	0.048	0.036	0.000
4703700391	UniFirst Corporation	001	5	39000699	0.100	0.090	0.010	0.119	0.107	0.012
4703700392	Pepsi Beverages Company	001	1	40500806	0.000	0.000	0.140	0.000	0.000	0.157
4703700392	Pepsi Beverages Company	001	2	40500806	0.000	0.000	5.570	0.000	0.000	6.250
4703700392	Pepsi Beverages Company	001	3	30299998	0.000	0.000	0.600	0.000	0.000	0.727
4703700394	Level 3 Communications	001	1	20100102	0.540	0.050	0.020	0.292	0.027	0.011
4703700395	Level 3 Communications	001	1	20100102	0.979	0.238	0.029	0.530	0.129	0.016
4703700395	Level 3 Communications	001	2	20100102	0.263	0.060	0.008	0.142	0.032	0.004
4703700396	Living Earth	001	1	20200102	8.080	0.720	0.150	9.427	0.840	0.175
4703700397	AT&T Tennessee	001	1	20300101	0.310	0.070	0.000	0.387	0.087	0.000
4703700398	Sinomax East, Inc.	001	1	30801005	0.000	0.000	0.060	0.000	0.000	0.082
4703700398	Sinomax East, Inc.	002	1	30801005	0.000	0.000	0.370	0.000	0.000	0.507
4703700398	Sinomax East, Inc.	003	1	40706403	0.000	0.000	0.001	0.000	0.000	0.002

4703700601	Mortuary Associates, Inc	001	1	50200101	0.026	0.017	0.001	0.036	0.024	0.002
4703700602	All Seasons Cremations	001	1	50200101	0.040	0.010	0.100	0.056	0.014	0.140
4703700606	Metro Animal Control	001	1	31502102	0.042	0.002	0.002	0.053	0.003	0.003
4703700609	Phillips Robinson Funeral Home	001	1	50200505	0.207	0.001	0.001	0.321	0.002	0.001
4703700610	West Harpeth Funeral Home	001	1	31502102	0.244	0.001	0.001	0.311	0.001	0.001
4703700611	Nashville Funeral & Cremation	001	1	31502102	0.187	0.000	0.035	0.238	0.000	0.045
4703700652	Nashville Cremation Service	001	1	31502102	0.689	0.018	0.009	0.879	0.023	0.012
4703700653	Music City Mortuary	001	1	31502102	0.300	0.997	0.300	0.383	1.272	0.383
4703700653	Music City Mortuary	003	1	31502102	0.401	0.331	0.000	0.512	0.422	0.000
4703700654	Highland Hills Funeral Home & Crematory	001	1	31502102	0.461	0.006	0.004	0.588	0.008	0.005
4703700655	Ellis Funeral Home & Cremation Service	001	1	50200101	0.140	0.000	0.000	0.196	0.000	0.000
4703700720	Joy Cleaners	002	1	41000202	0.000	0.000	0.127	0.000	0.000	0.162
4703700745	Stay Fresh Cleaners	002	1	41000202	0.000	0.000	0.750	0.000	0.000	0.957
4703700762	Mr. C's Cleaners	002	1	40100102	0.000	0.000	0.180	0.000	0.000	0.230
4703700788	Belle Place Cleaners, Inc.	002	1	41000202	0.000	0.000	0.180	0.000	0.000	0.230
4703700806	Park Avenue $2.99 Cleaners	002	1	41000101	0.000	0.000	0.400	0.000	0.000	0.510
4703700831	Belle Meade Cleaners	002	1	40100102	0.000	0.000	0.176	0.000	0.000	0.225
4703700001	Buzzi Unicem USA	011	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	012	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	013	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	014	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	015	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	016	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	017	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	018	1	30510102	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04A	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04B	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04C	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04D	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04E	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	04F	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	12A	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	12B	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	38A	1	30510604	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	38B	1	30510604	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D14	1	30501502	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D15	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D16	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D17	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D18	1	30501202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D19	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	D20	1	30510102	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	F12	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L01	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L02	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L03	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L04	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000

4703700001	Buzzi Unicem USA	L05	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L06	1	30599999	0.000	0.000	0.000	0.000	0.000	0.000
4703700001	Buzzi Unicem USA	L07	1	30501114	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	001	1	30500628	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	002	1	30500619	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	003	1	30500618	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	004	1	30500618	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	005	1	30500608	0.000	0.000	0.000	0.000	0.000	0.000
4703700003	Irving Materials, Inc.	006	1	30500718	0.000	0.000	0.000	0.000	0.000	0.000
4703700005	Innophos Inc.	008	1	30299998	0.000	0.000	0.000	0.000	0.000	0.000
4703700005	Innophos Inc.	010	2	10200501	0.000	0.000	0.000	0.000	0.000	0.000
4703700005	Innophos Inc.	012	1	20100109	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	001	1	30500252	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	001	3	30500252	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	002	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	004	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	004	2	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	004	3	30502015	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	004	4	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700009	Vulcan Construction Materials, LP	004	5	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	001	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	002	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	003	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	005	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	006	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700011	Holcim (US) Inc.	007	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700013	Greer Stop Nut, Inc.	001	1	30988801	0.000	0.000	0.000	0.000	0.000	0.000
4703700013	Greer Stop Nut, Inc.	001	3	30988801	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	001	1	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	002	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	003	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	004	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	005	1	30502011	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	006	1	30502011	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	007	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700015	Rogers Group, Inc. - REOstone, LLC	008	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	001	1	30502010	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	001	2	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	001	3	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	001	4	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	001	5	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	1	30502002	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	2	30502002	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	3	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	4	30502033	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	5	30502011	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	002	6	30502017	0.000	0.000	0.000	0.000	0.000	0.000

4703700016	Rogers Group, Inc.	002	7	30502005	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	003	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700016	Rogers Group, Inc.	003	2	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	001	1	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	002	1	30502005	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	003	1	30502099	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	004	1	30502099	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	005	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	006	1	27000320	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	006	2	27000320	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	007	1	27000320	0.000	0.000	0.000	0.000	0.000	0.000
4703700017	Vulcan Construction Materials, LP	007	2	30502004	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	001	1	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	002	1	30502002	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	003	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	004	1	30502005	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	005	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	006	1	30500205	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	007	1	30502510	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	008	1	30502099	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	009	1	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	010	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	011	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	012	1	20300101	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	013	1	20300101	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	014	1	30502017	0.000	0.000	0.000	0.000	0.000	0.000
4703700018	Vulcan Construction Materials, LP	015	1	30502006	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	001	1	30502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	002	1	30502002	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	003	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	005	1	30502713	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	005	2	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	006	1	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700019	Vulcan Construction Materials, LP	007	1	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700022	Dicaperl Minerals Corp.	002	1	30501801	0.000	0.000	0.000	0.000	0.000	0.000
4703700025	Ryman Hospitality Properties, Inc.	002	2	10300501	0.000	0.000	0.000	0.000	0.000	0.000
4703700025	Ryman Hospitality Properties, Inc.	005	1	40301021	0.000	0.000	0.000	0.000	0.000	0.000
4703700025	Ryman Hospitality Properties, Inc.	006	3	40200901	0.000	0.000	0.000	0.000	0.000	0.000
4703700025	Ryman Hospitality Properties, Inc.	008	1	41000201	0.000	0.000	0.000	0.000	0.000	0.000
4703700025	Ryman Hospitality Properties, Inc.	009	1	40301007	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	016	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	017	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	018	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	024	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	025	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	026	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	027	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000

4703700027	Akzo Nobel Coatings Inc.	028	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	029	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	030	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	031	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	032	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	033	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	034	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	035	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	036	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	037	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	038	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	039	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	040	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	041	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	042	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	043	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	044	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	045	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	046	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700027	Akzo Nobel Coatings Inc.	047	1	30101401	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	001	1	30200802	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	003	1	30200803	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	006	1	30200806	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	006	2	30200806	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	006	3	30200806	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	008	2	10300501	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	009	1	30200804	0.000	0.000	0.000	0.000	0.000	0.000
4703700029	Purina Animal Nutrition, LLC	010	1	30200805	0.000	0.000	0.000	0.000	0.000	0.000
4703700032	Safety-Kleen Systems	004	1	49099998	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	002	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	003	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	004	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	005	1	30510203	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	006	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	008	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	009	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	010	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700033	Quikrete - Nashville	011	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700037	Best One Tire & Service	001	1	30800501	0.000	0.000	0.000	0.000	0.000	0.000
4703700037	Best One Tire & Service	003	1	40200101	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	001	1	20200107	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	002	1	10300601	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	002	2	10300501	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	002	3	10300207	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	003	1	10300207	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	003	2	10300207	0.000	0.000	0.000	0.000	0.000	0.000
4703700039	Vanderbilt University	008	4	20300202	0.000	0.000	0.000	0.000	0.000	0.000

4703700040	Carlex Glass America, LLC	001	2	30501403	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	003	1	30501407	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	003	2	30501413	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	005	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	005	2	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	006	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	007	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	007	2	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	008	1	30501413	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	010	2	40200101	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	011	1	40200101	0.000	0.000	0.000	0.000	0.000	0.000
4703700040	Carlex Glass America, LLC	015	3	20100102	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	001	2	10200602	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	006	2	10200501	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	007	2	10200501	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	008	1	10200602	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	008	2	10200501	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	009	1	10200603	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	011	1	40202499	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	013	1	40188898	0.000	0.000	0.000	0.000	0.000	0.000
4703700042	Triumph Aerostructures, LLC	014	2	40202406	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	001	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	002	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	003	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	004	1	30501109	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	005	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	006	1	30501109	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	008	1	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	009	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	010	1	30502007	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	011	1	30502507	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	012	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	013	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	014	1	30502507	0.000	0.000	0.000	0.000	0.000	0.000
4703700047	Smyrna Ready Mix Concrete, LLC	015	1	30502504	0.000	0.000	0.000	0.000	0.000	0.000
4703700049	Metro Water Services - Central WWTP	027	1	50100799	0.000	0.000	0.000	0.000	0.000	0.000
4703700049	Metro Water Services - Central WWTP	028	1	50100799	0.000	0.000	0.000	0.000	0.000	0.000
4703700050	Nashville District Energy System	011	1	38500110	0.000	0.000	0.000	0.000	0.000	0.000
4703700061	Citgo Petroleum Corp.	007	1	40400109	0.000	0.000	0.000	0.000	0.000	0.000
4703700062	Cumberland Terminals, Inc.	007	1	40400150	0.000	0.000	0.000	0.000	0.000	0.000
4703700062	Cumberland Terminals, Inc.	008	1	40400109	0.000	0.000	0.000	0.000	0.000	0.000
4703700064	Blanchard Terminal Company, LLC	006	2	40400171	0.000	0.000	0.000	0.000	0.000	0.000
4703700064	Blanchard Terminal Company, LLC	010	4	40400153	0.000	0.000	0.000	0.000	0.000	0.000
4703700064	Blanchard Terminal Company, LLC	012	1	40400199	0.000	0.000	0.000	0.000	0.000	0.000
4703700065	Shell Oil Products US	008	5	40400199	0.000	0.000	0.000	0.000	0.000	0.000
4703700067	ExxonMobil Pipeline Corporation	006	1	40715811	0.000	0.000	0.000	0.000	0.000	0.000
4703700067	ExxonMobil Pipeline Corporation	024	4	40400150	0.000	0.000	0.000	0.000	0.000	0.000

4703700069	MPLX Terminals LLC - Bordeaux Terminal	010	4	40600145	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	001	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	002	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	003	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	004	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	005	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	005	2	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	005	3	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700077	Smyrna Ready Mix Concrete, LLC	006	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700079	MPLX Terminals LLC - Nashville Terminal	009	4	39990024	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	001	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	001	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	001	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	004	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	004	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	004	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	007	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	007	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	007	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	010	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	010	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	010	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	013	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	013	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	013	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	016	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	016	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	016	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	019	1	30501416	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	019	2	30501401	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	019	3	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	022	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	023	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	024	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	025	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	026	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	027	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	028	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	029	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	030	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	031	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	032	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	033	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	034	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	035	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	036	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000
4703700080	GAF Corporation	037	1	30501410	0.000	0.000	0.000	0.000	0.000	0.000

4703700081	United States Tobacco Mfg, LP	001	1	10200206	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	001	2	30203399	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	002	2	30203399	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	003	1	30203399	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	008	1	30203399	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	009	6	10200502	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	009	7	10200602	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	009	8	10200502	0.000	0.000	0.000	0.000	0.000	0.000
4703700081	United States Tobacco Mfg, LP	010	1	30203399	0.000	0.000	0.000	0.000	0.000	0.000
4703700083	Lithographics, Inc.	003	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	001	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	002	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	003	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	004	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	005	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	006	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	007	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700088	River Cement Sales Co. dba Buzzi Unicem	011	1	30510202	0.000	0.000	0.000	0.000	0.000	0.000
4703700090	Embraer Aircraft Maint Services, Inc	002	1	40100302	0.000	0.000	0.000	0.000	0.000	0.000
4703700090	Embraer Aircraft Maint Services, Inc	002	2	40202401	0.000	0.000	0.000	0.000	0.000	0.000
4703700090	Embraer Aircraft Maint Services, Inc	002	6	40100399	0.000	0.000	0.000	0.000	0.000	0.000
4703700090	Embraer Aircraft Maint Services, Inc	003	1	40202599	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	001	1	31401101	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	002	1	31401101	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	003	1	30510107	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	004	1	31401101	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	006	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700091	PSC Metals, LLC	008	1	20300107	0.000	0.000	0.000	0.000	0.000	0.000
4703700092	QG Printing II, LLC	003	1	30701201	0.000	0.000	0.000	0.000	0.000	0.000
4703700093	Southland Brick and Block	001	1	30510199	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	001	1	30501108	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	002	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	003	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	004	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	006	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700100	Irving Materials, Inc.	007	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700101	Pine Bluff Materials Co.	001	1	30510598	0.000	0.000	0.000	0.000	0.000	0.000
4703700101	Pine Bluff Materials Co.	002	1	30510598	0.000	0.000	0.000	0.000	0.000	0.000
4703700101	Pine Bluff Materials Co.	003	1	30510309	0.000	0.000	0.000	0.000	0.000	0.000
4703700102	Colonial Pipeline Company	001	2	40400179	0.000	0.000	0.000	0.000	0.000	0.000
4703700108	LaFarge North America, Inc.	001	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700108	LaFarge North America, Inc.	002	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700108	LaFarge North America, Inc.	003	1	30510502	0.000	0.000	0.000	0.000	0.000	0.000
4703700108	LaFarge North America, Inc.	004	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700108	LaFarge North America, Inc.	005	1	30510402	0.000	0.000	0.000	0.000	0.000	0.000
4703700118	Southern Machinery Co	001	2	40288824	0.000	0.000	0.000	0.000	0.000	0.000
4703700127	United Cabinet Corporation	002	1	30702003	0.000	0.000	0.000	0.000	0.000	0.000

4703700127	United Cabinet Corporation	003	1	50300102	0.000	0.000	0.000	0.000	0.000	0.000
4703700135	AmeriColor	001	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700135	AmeriColor	001	2	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700135	AmeriColor	001	5	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700139	Hennessy Industries, Inc.	001	2	40299998	0.000	0.000	0.000	0.000	0.000	0.000
4703700149	Cliff's Cabinet Company	002	1	30799998	0.000	0.000	0.000	0.000	0.000	0.000
4703700159	Creative Cabinetry Solutions, Inc.	002	1	40288801	0.000	0.000	0.000	0.000	0.000	0.000
4703700163	Skyline Madison Campus	002	1	31502001	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	002	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	004	1	30500204	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	004	2	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	005	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	006	1	30510298	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	006	2	30510105	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	006	3	30510105	0.000	0.000	0.000	0.000	0.000	0.000
4703700164	Vulcan Construction Materials, LP	006	4	20200107	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	001	1	30510309	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	001	2	30510309	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	001	3	30510398	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	002	1	30510309	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	002	2	30510309	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	003	1	30510198	0.000	0.000	0.000	0.000	0.000	0.000
4703700166	Pine Bluff Materials Co.	003	2	30510598	0.000	0.000	0.000	0.000	0.000	0.000
4703700176	Superior Trim	001	1	40200701	0.000	0.000	0.000	0.000	0.000	0.000
4703700176	Superior Trim	002	1	40200701	0.000	0.000	0.000	0.000	0.000	0.000
4703700179	Commercial Laminations, Inc.	005	1	30702003	0.000	0.000	0.000	0.000	0.000	0.000
4703700181	Irving Materials, Inc.	001	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700181	Irving Materials, Inc.	002	1	30501114	0.000	0.000	0.000	0.000	0.000	0.000
4703700181	Irving Materials, Inc.	003	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700181	Irving Materials, Inc.	004	1	30501108	0.000	0.000	0.000	0.000	0.000	0.000
4703700181	Irving Materials, Inc.	005	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700183	#N/A	002	1	40202599	0.000	0.000	0.000	0.000	0.000	0.000
4703700186	Servitech Industries, Inc.	002	1	40202501	0.000	0.000	0.000	0.000	0.000	0.000
4703700186	Servitech Industries, Inc.	007	1	30900208	0.000	0.000	0.000	0.000	0.000	0.000
4703700188	Dixie Graphics	003	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700188	Dixie Graphics	004	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700191	Ergon Asphalt & Emulsions, Inc.	002	2	40400103	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	001	1	30101809	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	002	1	30101809	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	003	1	30108001	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	004	1	30108001	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	008	2	10200602	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	010	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	010	3	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	011	1	30101809	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	013	2	10200503	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	014	2	10200601	0.000	0.000	0.000	0.000	0.000	0.000

4703700196	Fiberweb, Inc. (A Berry Global Company)	015	2	20200202	0.000	0.000	0.000	0.000	0.000	0.000
4703700196	Fiberweb, Inc. (A Berry Global Company)	016	1	38500101	0.000	0.000	0.000	0.000	0.000	0.000
4703700197	Magnetic Ticket & Label Corp.	002	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700197	Magnetic Ticket & Label Corp.	002	3	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700197	Magnetic Ticket & Label Corp.	002	4	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700197	Magnetic Ticket & Label Corp.	011	2	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700197	Magnetic Ticket & Label Corp.	015	1	40204435	0.000	0.000	0.000	0.000	0.000	0.000
4703700198	Summit Medical Center	003	2	20100107	0.000	0.000	0.000	0.000	0.000	0.000
4703700204	Jones Bros. Contractors, LLC	002	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700204	Jones Bros. Contractors, LLC	003	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700204	Jones Bros. Contractors, LLC	004	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	001	2	30500205	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	002	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	003	1	30500204	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	003	2	30500290	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	004	1	30500290	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	004	3	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	005	1	30504031	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	006	1	30504034	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	006	2	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	007	1	30504031	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	007	2	20200102	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	008	1	30510298	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	008	2	30510105	0.000	0.000	0.000	0.000	0.000	0.000
4703700208	Vulcan Construction Materials, LP	008	3	30510105	0.000	0.000	0.000	0.000	0.000	0.000
4703700213	Trew Industrial Wheels, Inc.	003	1	30800702	0.000	0.000	0.000	0.000	0.000	0.000
4703700213	Trew Industrial Wheels, Inc.	003	2	30800703	0.000	0.000	0.000	0.000	0.000	0.000
4703700213	Trew Industrial Wheels, Inc.	003	3	30800702	0.000	0.000	0.000	0.000	0.000	0.000
4703700213	Trew Industrial Wheels, Inc.	005	1	30800705	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	1	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	2	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	3	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	4	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	5	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	6	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	001	7	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700214	Nashville Ready Mix, Inc.	002	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700220	Rogers Group, Inc.	001	2	30500240	0.000	0.000	0.000	0.000	0.000	0.000
4703700220	Rogers Group, Inc.	002	1	30500204	0.000	0.000	0.000	0.000	0.000	0.000
4703700220	Rogers Group, Inc.	002	2	30500290	0.000	0.000	0.000	0.000	0.000	0.000
4703700220	Rogers Group, Inc.	003	1	30500203	0.000	0.000	0.000	0.000	0.000	0.000
4703700222	TWIG America Inc.	001	1	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700222	TWIG America Inc.	001	2	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700231	S & H Chrome Plating & Powder Coating	001	1	30901028	0.000	0.000	0.000	0.000	0.000	0.000
4703700231	S & H Chrome Plating & Powder Coating	002	1	30901068	0.000	0.000	0.000	0.000	0.000	0.000
4703700233	Smyrna Ready Mix Concrete, LLC	001	1	30510498	0.000	0.000	0.000	0.000	0.000	0.000
4703700233	Smyrna Ready Mix Concrete, LLC	001	2	30510498	0.000	0.000	0.000	0.000	0.000	0.000

4703700233	Smyrna Ready Mix Concrete, LLC	002	3	30510498	0.000	0.000	0.000	0.000	0.000	0.000
4703700233	Smyrna Ready Mix Concrete, LLC	003	4	30510498	0.000	0.000	0.000	0.000	0.000	0.000
4703700251	R.J. Wherry and Associates, Inc.	001	5	40288801	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	001	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	001	2	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	001	3	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	002	1	30501112	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	002	2	30501112	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	003	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	003	2	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	003	3	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	004	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	004	2	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	004	3	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	005	1	30501112	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	005	2	30501112	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	006	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	006	2	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700252	Smyrna Ready Mix Concrete, LLC	006	3	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	001	1	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	002	1	30500618	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	003	1	30500618	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	004	1	30501111	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	005	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700262	CEMEX, Inc.	006	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700266	Mid-Tech Gage, Inc.	001	1	30901018	0.000	0.000	0.000	0.000	0.000	0.000
4703700269	North American Composites Co.	001	1	30101866	0.000	0.000	0.000	0.000	0.000	0.000
4703700269	North American Composites Co.	001	2	30101866	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	001	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	002	1	20200107	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	003	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	004	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	005	1	30700821	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	006	1	30704004	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	007	1	20200107	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	008	1	30704002	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	009	2	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700272	Alternative Energy, LLC	010	2	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700276	The Mulch Company, LLC	001	1	30704003	0.000	0.000	0.000	0.000	0.000	0.000
4703700276	The Mulch Company, LLC	001	3	30704002	0.000	0.000	0.000	0.000	0.000	0.000
4703700276	The Mulch Company, LLC	001	4	30704004	0.000	0.000	0.000	0.000	0.000	0.000
4703700276	The Mulch Company, LLC	001	5	30700821	0.000	0.000	0.000	0.000	0.000	0.000
4703700279	ARAMARK Uniform Services	003	1	39000699	0.000	0.000	0.000	0.000	0.000	0.000
4703700279	ARAMARK Uniform Services	003	2	39000699	0.000	0.000	0.000	0.000	0.000	0.000
4703700279	ARAMARK Uniform Services	003	3	39000699	0.000	0.000	0.000	0.000	0.000	0.000
4703700285	Smyrna Ready Mix Concrete, LLC	001	1	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700285	Smyrna Ready Mix Concrete, LLC	002	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000

4703700285	Smyrna Ready Mix Concrete, LLC	003	1	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700285	Smyrna Ready Mix Concrete, LLC	004	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700285	Smyrna Ready Mix Concrete, LLC	005	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700290	AZZ Galvanizing - Nashville	001	1	30901103	0.000	0.000	0.000	0.000	0.000	0.000
4703700290	AZZ Galvanizing - Nashville	001	2	30901103	0.000	0.000	0.000	0.000	0.000	0.000
4703700290	AZZ Galvanizing - Nashville	002	1	30901102	0.000	0.000	0.000	0.000	0.000	0.000
4703700290	AZZ Galvanizing - Nashville	005	1	30901103	0.000	0.000	0.000	0.000	0.000	0.000
4703700290	AZZ Galvanizing - Nashville	005	2	30901103	0.000	0.000	0.000	0.000	0.000	0.000
4703700293	Marangoni Tread, N.A., Inc.	001	1	30800501	0.000	0.000	0.000	0.000	0.000	0.000
4703700294	Berry Film Products Company, Inc.	007	3	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700294	Berry Film Products Company, Inc.	007	4	40500403	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	1	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	2	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	3	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	4	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	5	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	6	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700296	Smyrna Ready Mix Concrete, LLC	001	7	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700299	Healthcare Realty Services, Inc.	001	2	10300502	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	001	1	30501113	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	002	1	30510298	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	003	1	30501110	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	004	1	30510305	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	005	1	30510299	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	006	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	007	1	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700300	Nashville Ready Mix, Inc.	008	1	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700302	Waste Management of Nashville	014	2	40201001	0.000	0.000	0.000	0.000	0.000	0.000
4703700316	CHEP Recycled Pallet Solutions, LLC	002	1	30788801	0.000	0.000	0.000	0.000	0.000	0.000
4703700316	CHEP Recycled Pallet Solutions, LLC	002	2	30704005	0.000	0.000	0.000	0.000	0.000	0.000
4703700324	Lipscomb University	001	2	10300502	0.000	0.000	0.000	0.000	0.000	0.000
4703700326	American Sugar Refining	001	1	30201542	0.000	0.000	0.000	0.000	0.000	0.000
4703700326	American Sugar Refining	002	1	30201542	0.000	0.000	0.000	0.000	0.000	0.000
4703700326	American Sugar Refining	003	1	30201542	0.000	0.000	0.000	0.000	0.000	0.000
4703700327	Rogers Group, Inc.	001	1	30510505	0.000	0.000	0.000	0.000	0.000	0.000
4703700327	Rogers Group, Inc.	001	2	30510505	0.000	0.000	0.000	0.000	0.000	0.000
4703700327	Rogers Group, Inc.	001	3	30510405	0.000	0.000	0.000	0.000	0.000	0.000
4703700327	Rogers Group, Inc.	001	4	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700327	Rogers Group, Inc.	002	1	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700335	Advanced Composites, Inc.	001	1	30101864	0.000	0.000	0.000	0.000	0.000	0.000
4703700335	Advanced Composites, Inc.	003	1	30101821	0.000	0.000	0.000	0.000	0.000	0.000
4703700335	Advanced Composites, Inc.	006	1	30101817	0.000	0.000	0.000	0.000	0.000	0.000
4703700348	3M Company	001	1	33000199	0.000	0.000	0.000	0.000	0.000	0.000
4703700348	3M Company	001	5	33000199	0.000	0.000	0.000	0.000	0.000	0.000
4703700348	3M Company	001	6	33000199	0.000	0.000	0.000	0.000	0.000	0.000
4703700348	3M Company	002	1	33000199	0.000	0.000	0.000	0.000	0.000	0.000
4703700348	3M Company	002	2	33000199	0.000	0.000	0.000	0.000	0.000	0.000

4703700351	American Farms	001	1	30502510	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	1	30502511	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	2	30502511	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	3	30502503	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	4	20300101	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	5	30502502	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	002	6	20300101	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	003	1	30502511	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	003	2	30502503	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	003	3	30502502	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	004	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	004	2	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	004	3	30700822	0.000	0.000	0.000	0.000	0.000	0.000
4703700351	American Farms	005	1	30502504	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	001	1	31100204	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	001	2	31100299	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	001	3	30588801	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	002	1	31100299	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	003	2	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	003	3	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700352	Waste Management of Tennessee - MTEC	003	4	30700822	0.000	0.000	0.000	0.000	0.000	0.000
4703700354	C&J Mulch, Inc.	002	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700354	C&J Mulch, Inc.	003	1	30700821	0.000	0.000	0.000	0.000	0.000	0.000
4703700354	C&J Mulch, Inc.	004	1	30700822	0.000	0.000	0.000	0.000	0.000	0.000
4703700354	C&J Mulch, Inc.	005	1	30700899	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	001	1	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	001	2	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	001	3	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	001	4	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	001	5	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	1	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	2	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	3	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	4	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	5	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	6	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	7	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	8	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	002	9	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	1	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	2	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	3	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	4	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	5	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	6	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	003	7	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	004	1	30180001	0.000	0.000	0.000	0.000	0.000	0.000

4703700363	Sontara Old Hickory, Inc.	004	2	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	004	3	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	004	4	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700363	Sontara Old Hickory, Inc.	004	5	30180001	0.000	0.000	0.000	0.000	0.000	0.000
4703700364	Service King Paint & Body, LLC	001	2	40201699	0.000	0.000	0.000	0.000	0.000	0.000
4703700378	Service King Collision Repair Center	001	2	40201001	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	002	1	30903004	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	004	1	40202543	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	005	1	40202543	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	006	1	30900201	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	008	1	30402201	0.000	0.000	0.000	0.000	0.000	0.000
4703700381	Kennametal, Inc.	010	1	40301021	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	1	30501101	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	2	30501101	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	3	30501107	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	4	30501106	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	5	30501108	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	6	30501109	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	7	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	8	30501115	0.000	0.000	0.000	0.000	0.000	0.000
4703700386	Foley Products Company	001	9	30501199	0.000	0.000	0.000	0.000	0.000	0.000
4703700387	TriStar Southern Hills Medical Center	001	1	10300603	0.000	0.000	0.000	0.000	0.000	0.000
4703700387	TriStar Southern Hills Medical Center	001	2	10300503	0.000	0.000	0.000	0.000	0.000	0.000
4703700387	TriStar Southern Hills Medical Center	002	1	20300101	0.000	0.000	0.000	0.000	0.000	0.000
4703700391	UniFirst Corporation	001	6	33000106	0.000	0.000	0.000	0.000	0.000	0.000
4703700392	Pepsi Beverages Company	001	4	38500101	0.000	0.000	0.000	0.000	0.000	0.000
4703700393	Welcome to 1979 Industries, LLC	001	1	30901068	0.000	0.000	0.000	0.000	0.000	0.000
4703700396	Living Earth	002	1	30700820	0.000	0.000	0.000	0.000	0.000	0.000
4703700396	Living Earth	003	1	30700896	0.000	0.000	0.000	0.000	0.000	0.000
4703700653	Music City Mortuary	002	1	31502102	0.000	0.000	0.000	0.000	0.000	0.000
4703700705	Bordeaux Cleaners	002	1	41000201	0.000	0.000	0.000	0.000	0.000	0.000
4703700720	Joy Cleaners	001	1	40100101	0.000	0.000	0.000	0.000	0.000	0.000
4703700762	Mr. C's Cleaners	001	1	40100101	0.000	0.000	0.000	0.000	0.000	0.000
4703700788	Belle Place Cleaners, Inc.	001	1	41000201	0.000	0.000	0.000	0.000	0.000	0.000
4703700831	Belle Meade Cleaners	001	1	40100101	0.000	0.000	0.000	0.000	0.000	0.000
4703700832	Nashville Dry Cleaners	001	1	40100101	0.000	0.000	0.000	0.000	0.000	0.000
4703700832	Nashville Dry Cleaners	001	2	40100102	0.000	0.000	0.000	0.000	0.000	0.000
Total Emissions					**1,285.79**	**530.89**	**1,001.45**	**1,567.47**	**657.21**	**1,208.04**

Appendix I

Point Source Emissions Inventory

for Four Facilities

Point Source Emission Inventory for Four Facilities

Baseline (2014 NEI) and projected future (2022) point source VOC, CO, and NO_X emissions are shown below.

Facility	County	Emissions (tons/year)					
		2014 NEI V1			2022 Projection		
		CO	NO_X	VOC	CO	NO_X	VOC
BFI Waste Systems of Tennessee, LLC - Middle Point Landfill	Rutherford	133.02	24.45	25.46	186.47	34.28	28.90
Bridgestone Americas Tire Operations, LLC	Rutherford	26.73	25.92	203.55	26.73	25.92	203.55
Hoeganaes Corporation	Sumner	793.20	94.65	6.73	751.16	89.63	6.37
TVA Gallatin Fossil Plant	Sumner	884.22	5106.17	106.24	872.72	1142.97	102.95

BFI Waste Systems of Tennessee, LLC - Middle Point Landfill

Future emissions were estimated using the Title V renewal application dated August 22, 2018. The Title V renewal application used EPA's LandGEM (Landfill Gas Emissions Model) to calculate future landfill gas generation rates from historic and projected waste acceptance rates. The ratio of 2022 to 2014 landfill gas generation rates was used to scale the 2014 NEI to obtain future emissions.

TVA Gallatin

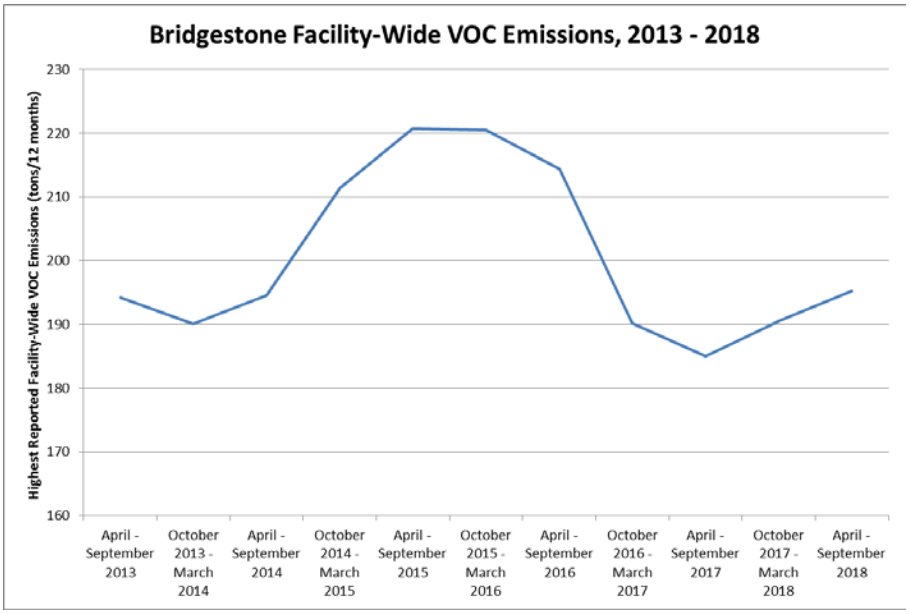
Future NO_X emissions from Gallatin's coal fired boilers were estimated from Acid Rain Program data (EPA Clean Air Markets Division). Since the heat input to these boilers varies from year to year, the median heat input from 1995 to 2017 was used as a basis for future emissions. TVA is installing SCR to control NO_X emissions from the coal-fired boilers, and a controlled emission rate of 0.03 lb/MMBtu was used to project NO_X emissions from these units.

CO and VOC emissions from the coal units were estimated using the 1995-2017 median heat input and an emission factor of 24,317 lb/TBtu for CO and 2,918 lb/TBtu for VOC. These emission factors are based on AP-42 and were obtained from the Title V renewal application for TVA's Kingston Fossil Plant. The AP-42 emission factors are based on pound of emissions per ton of coal, and TVA used the fuel mixture for Kingston to convert emissions into a heat input basis. The amount of coal burned at Gallatin was not known, but the fuel mixtures at Gallatin and Kingston were assumed to be comparable.

For the natural gas-fired combustion turbines, future emissions were estimated using Acid Rain Program data (NO_X) or AP-42 emission factors (CO and VOC). Because TVA has been increasing the use of simple-cycle combustion turbines due to the lower price of natural gas, emissions were based on the highest reported annual heat input and the highest reported NO_X emission rate for 2000- 2017.

Bridgestone Americas Tire Operations, LLC

Bridgestone's Title V semiannual reports for the period of April 1, 2013 to September 30, 2018 were reviewed to determine the trends and variability in facility-wide VOC emissions. The highest reported 12-month total VOC emissions were 220.73 tons (reporting period of April – September 2015). The 12-month total emissions averaged 200.63 tons/year between April 2013 and September 2018, with a minimum of 184.98 tons (April – September 2017) and a maximum of 220.73 tons (April – September 2015). Emissions changed over time as shown below:



Because VOC emissions reported in the 2014 NEI are comparable to the historic average emission rate for this facility, the 2022 projection was based on the 2014 NEI.

Hoeganaes Corporation

Future emissions were estimated from the 2014 emission inventory and the monthly production rates reported in the facility's Title V semiannual reports (October 2013 - September 2018). A comparison of monthly production rates for calendar years 2014 and 2017 indicated a 5.3% decrease in the monthly production rate. Future year emissions were estimated by multiplying the 2014 NEI results by 94.7% (i. e., emissions were adjusted downward based on the change in production).

Appendix J

Nonpoint Emissions Inventory

Appendix J: Nonpoint emission inventory

For the nonpoint emission inventory, fourteen categories were determined to be contributors to the particular pollutants of interest, i.e. CO, NOx, and VOC. The development of the nonpoint emission inventory was completed by following the EPA's established methodologies that are laid out in the nonpoint tools published by the EPA and available on the NOMAD Sharepoint website.

The following is a description of the pages in this appendix:

Page Number	**Description**
J-2	This page shows the fourteen categories and the source of the 2014 data.
J-3	This page shows the fourteen categories and the SCC codes that were examined.
J-4, J-5, J-6	These pages show the description of each individual SCC
J-7, J-8, J-9	These pages give an explanation of how the emissions were projected to 2022.
J-10 through J-15	These pages show the 2014 and 2022 emissions from each individual SCC
J-16 through J-19	This page shows the total 2014 and 2022 emissions for the fourteen categories

2014 Data Sources

Sector (and link to summary table)	sub-sector	Source of 2014 Nonpoint Data	Comment
Ag Live Stock		aglivestock_emissions_2014NEIv2_EPA.xlsx	NOMAD 2014 NEI v2 Tool
Ag Pesticides		2014_Agricultural_Pesticides_2461850000_Emissions_v2.1.xlsx	NOMAD 2014 NEI v2 Tool
Asphalt Paving	cutback	asphalt_paving_cutback_2461021000_emissions_sameas2008 v2.xlsx	NOMAD 2014 NEI v2 Tool
	emulsified	asphalt_paving_emulsified_2461022000_emissions_sameas2008 v2.xlsx	NOMAD 2014 NEI v2 Tool
Aviation Gas	stage 1	2014_Aviation_Gasoline_Distribution_Stage_1_2501080050_Emissions_v4.1.xlsx	NOMAD 2014 NEI v2 Tool
	stage 2	2014_Aviation_Gasoline_Distribution_Stage_2_2501080100_Emissions_v4.1.xlsx	NOMAD 2014 NEI v2 Tool
Commercial Cooking		2014_Commerical Cooking_Emissions_v1.5.accdb	NOMAD 2014 NEI v2 Tool
Composting		2014_Greenwaste_Compost_2680003000_v4.xlsx	NOMAD 2014 NEI v2 Tool
Gasoline - Stage 1 Distribution	Bulk Plants	2014_Gasoline_Distribution_Stage_I_Bulk_Plants_2501055120_CAP_Emissions_v1_1	NOMAD 2014 NEI v2 Tool
	Bulk Terminals	2014_Gasoline_Distribution_Stage_I_Bulk_Terminals_2501050120_CAP_Emissions_v1_1.xls	NOMAD 2014 NEI v2 Tool
	Pipelines	2014_Gasoline_Distribution_Stage_I_Pipelines_2505040120_CAP_Emissions_v1_1.xls	NOMAD 2014 NEI v2 Tool
	Service Station	2014_Gasoline_Distribution_Stage_I_Service_Station_Unloading_v1.2.accdb	NOMAD 2014 NEI v2 Tool
Human Cremation		human_cremation_2810060100_EPA_2014v2.xlsx	NOMAD 2014 NEI v2 Tool
ICI Fuel Combustion		ICI Tool v1.6.accdb	NOMAD 2014 NEI v2 Tool
Open Burning	Land Clearing debris	2014_open_burning_land_clearing_debris_2610000500_CAP_emissions_v1_4.xlsx	NOMAD 2014 NEI v2 Tool
	MSW	2014_open_burning_MSW_2610030000_CAP_emissions_v1.1.xlsx	NOMAD 2014 NEI v2 Tool
	Yard waste brush	2014_open_burning_yard_waste_brush_2610000400_CAP_emissions_v1.1.xlsx	NOMAD 2014 NEI v2 Tool
	Yard waste leaf	2014_open_burning_yard_waste_leaf_2610000100_CAP_emissions_v1.1.xlsx	NOMAD 2014 NEI v2 Tool
Residential Charcoal Grilling (RCG)		NOMAD Residential Charcoal Grilling Tool_v1_1.accdb	NOMAD 2014 NEI v2 Tool
Residential Heating	Coal	2014_residential_coal_2104001000_2104002000_cap_emissions_v1.3.xlsx	NOMAD 2014 NEI v2 Tool
	Distillate	2014_residential_distillate_2104004000_cap_emissions_v1.3.xlsx	NOMAD 2014 NEI v2 Tool
	Kerosene	2014_residential_kerosene_210401100_cap_emissions_v1.3.xlsx	NOMAD 2014 NEI v2 Tool
	LPG	2014_residential_LPG_2104007000_emissions_v1.3.xlsx	NOMAD 2014 NEI v2 Tool
	NG	2014_residential_natural_gas_2104006000_emissions_v1.3.xlsx	NOMAD 2014 NEI v2 Tool
Residential Wood Combustion (RWC)		RWC_Tool_v3.2_DRAFT.accdb	NOMAD 2014 NEI v2 Tool
Solvents		Solvent Tool v1_7_Graphic Arts_Population.accdb	NOMAD 2014 NEI v2 Tool

Nonpoint Inventory Total Emissions

Selected Source Classification Codes (SCC)

Ag Livestock	Ag Pesticides	Asphalt Paving	Aviation Gasoline	Gasoline Stage 1	Commercial Cooking	Composting	Human Cremation	Open Burning	Residential Heating	RWC	RCG	ICI	Solvent SCCs
2805002000	2461850000	2461021000	2501080050	2501055120	2302002100	2680003000	2810060100	2610000500	2104001000	2104008100	2810025000	2102001000	2401001000
2805018000		2461022000	2501080100	2501050120	2302002200			2610030000	2104002000	2104008210		2102002000	2401005000
2805025000				2505040120	2302003000			2610000400	2104004000	2104008220		2102004001	2401008000
2805007100				2501060051	2302003100			2610000100	2104011000	2104008230		2102004002	2401015000
2805009100				2501060052	2302003200				2104007000	2104008310		2102005000	2401020000
				2501060053					2104006000	2104008320		2102006000	2401025000
										2104008330		2102007000	2401030000
										2104008400		2102008000	2401040000
										2104008510		2102011000	2401055000
										2104008610		2103001000	2401060000
										2104008700		2103002000	2401065000
										2104009000		2103004001	2401070000
												2103004002	2401075000
												2103005000	2401080000
												2103006000	2401090000
												2103007000	2401100000
												2103008000	2401200000
												2103011000	2415000000
													2420000000
													2425000000
													2460100000
													2460200000
													2460400000
													2460500000
													2460600000
													2460800000
													2460900000

SCC description

SCC	Category	scc level one>scc level two>scc level three>scc level four
2102001000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Anthracite Coal>Total: All Boiler Types
2102002000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Bituminous/Subbituminous Coal>Total: All Boiler Types
2102004001	Nonpoint	Stationary Source Fuel Combustion>Industrial>Distillate Oil>All Boiler Types
2102004002	Nonpoint	Stationary Source Fuel Combustion>Industrial>Distillate Oil>All IC Engine Types
2102005000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Residual Oil>Total: All Boiler Types
2102006000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Natural Gas>Total: Boilers and IC Engines
2102007000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Liquified Petroleum Gas (LPG)>Total: All Boiler Types
2102008000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Wood>Total: All Boiler Types
2102011000	Nonpoint	Stationary Source Fuel Combustion>Industrial>Kerosene>Total: All Boiler Types
2103001000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Anthracite Coal>Total: All Boiler Types
2103002000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Bituminous/Subbituminous Coal>Total: All Boiler Types
2103004001	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Distillate Oil>Boilers
2103004002	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Distillate Oil>IC Engines
2103005000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Residual Oil>Total: All Boiler Types
2103006000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Natural Gas>Total: Boilers and IC Engines
2103007000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Liquified Petroleum Gas (LPG)>Total: All Combustor Types
2103008000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Wood>Total: All Boiler Types
2103011000	Nonpoint	Stationary Source Fuel Combustion>Commercial/Institutional>Kerosene>Total: All Combustor Types
2104001000	Nonpoint	Stationary Source Fuel Combustion>Residential>Anthracite Coal>Total: All Combustor Types
2104002000	Nonpoint	Stationary Source Fuel Combustion>Residential>Bituminous/Subbituminous Coal>Total: All Combustor Types
2104004000	Nonpoint	Stationary Source Fuel Combustion>Residential>Distillate Oil>Total: All Combustor Types
2104006000	Nonpoint	Stationary Source Fuel Combustion>Residential>Natural Gas>Total: All Combustor Types
2104007000	Nonpoint	Stationary Source Fuel Combustion>Residential>Liquified Petroleum Gas (LPG)>Total: All Combustor Types
2104008100	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Fireplace: general
2104008210	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: fireplace inserts; non-EPA certified
2104008220	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: fireplace inserts; EPA certified; non-catalytic
2104008230	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: fireplace inserts; EPA certified; catalytic
2104008310	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: freestanding, non-EPA certified
2104008320	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: freestanding, EPA certified, non-catalytic
2104008330	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: freestanding, EPA certified, catalytic
2104008400	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Woodstove: pellet-fired, general (freestanding or FP insert)
2104008510	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Furnace: Indoor, cordwood-fired, non-EPA certified
2104008610	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Hydronic heater: outdoor

2104008700	Nonpoint	Stationary Source Fuel Combustion>Residential>Wood>Outdoor wood burning device, NEC (fire-pits, chimeas, etc)
2104009000	Nonpoint	Stationary Source Fuel Combustion>Residential>Firelog>Total: All Combustor Types
2104011000	Nonpoint	Stationary Source Fuel Combustion>Residential>Kerosene>Total: All Heater Types
2302002100	Nonpoint	Industrial Processes>Food and Kindred Products: SIC 20>Commercial Cooking - Charbroiling>Conveyorized Charbroiling
2302002200	Nonpoint	Industrial Processes>Food and Kindred Products: SIC 20>Commercial Cooking - Charbroiling>Under-fired Charbroiling
2302003000	Nonpoint	Industrial Processes>Food and Kindred Products: SIC 20>Commercial Cooking - Frying>Deep Fat Frying
2302003100	Nonpoint	Industrial Processes>Food and Kindred Products: SIC 20>Commercial Cooking - Frying>Flat Griddle Frying
2302003200	Nonpoint	Industrial Processes>Food and Kindred Products: SIC 20>Commercial Cooking - Frying>Clamshell Griddle Frying
2401001000	Nonpoint	Solvent Utilization>Surface Coating>Architectural Coatings>Total: All Solvent Types
2401005000	Nonpoint	Solvent Utilization>Surface Coating>Auto Refinishing: SIC 7532>Total: All Solvent Types
2401008000	Nonpoint	Solvent Utilization>Surface Coating>Traffic Markings>Total: All Solvent Types
2401015000	Nonpoint	Solvent Utilization>Surface Coating>Factory Finished Wood: SIC 2426 thru 242>Total: All Solvent Types
2401020000	Nonpoint	Solvent Utilization>Surface Coating>Wood Furniture: SIC 25>Total: All Solvent Types
2401025000	Nonpoint	Solvent Utilization>Surface Coating>Metal Furniture: SIC 25>Total: All Solvent Types
2401030000	Nonpoint	Solvent Utilization>Surface Coating>Paper: SIC 26>Total: All Solvent Types
2401040000	Nonpoint	Solvent Utilization>Surface Coating>Metal Cans: SIC 341>Total: All Solvent Types
2401055000	Nonpoint	Solvent Utilization>Surface Coating>Machinery and Equipment: SIC 35>Total: All Solvent Types
2401060000	Nonpoint	Solvent Utilization>Surface Coating>Large Appliances: SIC 363>Total: All Solvent Types
2401065000	Nonpoint	Solvent Utilization>Surface Coating>Electronic and Other Electrical: SIC 36 - 363>Total: All Solvent Types
2401070000	Nonpoint	Solvent Utilization>Surface Coating>Motor Vehicles: SIC 371>Total: All Solvent Types
2401075000	Nonpoint	Solvent Utilization>Surface Coating>Aircraft: SIC 372>Total: All Solvent Types
2401080000	Nonpoint	Solvent Utilization>Surface Coating>Marine: SIC 373>Total: All Solvent Types
2401090000	Nonpoint	Solvent Utilization>Surface Coating>Miscellaneous Manufacturing>Total: All Solvent Types
2401100000	Nonpoint	Solvent Utilization>Surface Coating>Industrial Maintenance Coatings>Total: All Solvent Types
2401200000	Nonpoint	Solvent Utilization>Surface Coating>Other Special Purpose Coatings>Total: All Solvent Types
2415000000	Nonpoint	Solvent Utilization>Degreasing>All Processes/All Industries>Total: All Solvent Types
2420000000	Nonpoint	Solvent Utilization>Dry Cleaning>All Processes>Total: All Solvent Types
2425000000	Nonpoint	Solvent Utilization>Graphic Arts>All Processes>Total: All Solvent Types
2460100000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All Personal Care Products>Total: All Solvent Types
2460200000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All Household Products>Total: All Solvent Types
2460400000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All Automotive Aftermarket Products>Total: All Solvent Types
2460500000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All Coatings and Related Products>Total: All Solvent Types
2460600000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All Adhesives and Sealants>Total: All Solvent Types
2460800000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>All FIFRA Related Products>Total: All Solvent Types
2460900000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Consumer and Commercial>Miscellaneous Products (Not Otherwise Covered)>Total: All Solvent Types
2461021000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Commercial>Cutback Asphalt>Total: All Solvent Types

2461022000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Commercial>Emulsified Asphalt>Total: All Solvent Types
2461850000	Nonpoint	Solvent Utilization>Miscellaneous Non-industrial: Commercial>Pesticide Application: Agricultural>All Processes
2501050120	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Bulk Terminals: All Evaporative Losses>Gasoline
2501055120	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Bulk Plants: All Evaporative Losses>Gasoline
2501060051	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Gasoline Service Stations>Stage 1: Submerged Filling
2501060052	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Gasoline Service Stations>Stage 1: Splash Filling
2501060053	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Gasoline Service Stations>Stage 1: Balanced Submerged Filling
2501080050	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Airports : Aviation Gasoline>Stage 1: Total
2501080100	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Storage>Airports : Aviation Gasoline>Stage 2: Total
2505040120	Nonpoint	Storage and Transport>Petroleum and Petroleum Product Transport>Pipeline>Gasoline
2610000100	Nonpoint	Waste Disposal, Treatment, and Recovery>Open Burning>All Categories>Yard Waste - Leaf Species Unspecified
2610000400	Nonpoint	Waste Disposal, Treatment, and Recovery>Open Burning>All Categories>Yard Waste - Brush Species Unspecified
2610000500	Nonpoint	Waste Disposal, Treatment, and Recovery>Open Burning>All Categories>Land Clearing Debris (use 28-10-005-000 for Logging Debris Burning)
2610030000	Nonpoint	Waste Disposal, Treatment, and Recovery>Open Burning>Residential>Household Waste (use 26-10-000-xxx for Yard Wastes)
2680003000	Nonpoint	Waste Disposal, Treatment, and Recovery>Composting>100% Green Waste (e.g., residential or municipal yard wastes)>All Processes
2805002000	Nonpoint	Miscellaneous Area Sources>Agriculture Production - Livestock>Beef cattle production composite>Not Elsewhere Classified
2805007100	Nonpoint	Miscellaneous Area Sources>Agriculture Production - Livestock>Poultry production - layers with dry manure management systems>Confinement
2805009100	Nonpoint	Miscellaneous Area Sources>Agriculture Production - Livestock>Poultry production - broilers>Confinement
2805018000	Nonpoint	Miscellaneous Area Sources>Agriculture Production - Livestock>Dairy cattle composite>Not Elsewhere Classified
2805025000	Nonpoint	Miscellaneous Area Sources>Agriculture Production - Livestock>Swine production composite>Not Elsewhere Classified (see also 28-05-039, -047, -053)
2810025000	Nonpoint	Miscellaneous Area Sources>Other Combustion>Charcoal Grilling - Residential (see 23-02-002-xxx for Commercial)>Total
2810060100	Nonpoint	Miscellaneous Area Sources>Other Combustion>Cremation>Humans

Explanation of 2022 Emission Projections

Agricultural Livestock - Livestock annual total populations from 2013 through 2016 were used to forecast the livestock total population for 2022. The county populations of livestock as a percentage of the total state livestock population were assumed to be constant. Emission calculations were made following the nonpoint methodology published by EPA.

Agricultural Pesticides - The number of acres of land in each county on which agricultural pesticides are used is assumed to remain constant, thus Ag Pesticide usage is assumed to remain constant.

Asphalt Paving - From the EPA nonpoint tool the 2014 emissions were obtained and the percentages calculated for cutback and emulsified. From research the growth expectation assumption of 3.1 % per year was established for the US totals. From that the US totals are calculated through year 2022. The next assumption was that the percentage split of cutback and emulsified would be constant across the US. From all of this the US total tonnage for both cutback and emulsified asphalt is calculated for each year through 2022. From the NOMAD tools the 2014 tonnage data for TN is used to calculate the state percentage of the total US tonnage. It is assumed that the percentage split between states will remain constant. From this the projected tonnage in TN through year 2022 is calculated. Average county VMT percentages calculated from TDOT data from the 11 year span from 2005 through 2016 are used to apportion the year 2022 TN asphalt totals to the counties. These tonnage numbers are then used to calculate the year 2022 VOC emissions. The conversion equation of tons to barrels is copied from the nonpoint tools. The emission factors are taken from the nonpoint tools.

Aviation Gasoline Distribution - EIA SEDS data was used to forecast the amount of AV GAS consumption for year 2022. FAA TAF data was collected and the OPS data was used to establish the county apportionment of the consumption. The county percentage apportionment developed varied slightly from that developed by the EPA for the tool so assumption was made that the EPA county apportionment percentages will remain constant through year 2022. The year 2022 emissions were calculated by substituting the year 2022 AV GAS consumption forecast into the EPA tool.

Commercial Cooking - The number of restaurants in each county was obtained for years 2012 through 2015 from the US Census County Business Patterns datasets extracting data on the two NAICS specified in the tool (EPA Commercial Cooking Non-Point Tool). From that data the year 2022 number of restaurants in each county was forecast. Then taking from the tool documentation the emission calculation methodology, it is assumed that the percent of restaurants with the type equipment of interest, the number of units per restaurant, and the average amount of food in tons/year cooked at a restaurant are assumed to remain constant. The emission factors from the tool are used in making the final emission calculations.

Composting - Year 2022 TN population was forecast based on US Census estimates for Years 2010-2016. Sector employment is assumed to remain constant. Yard waste per capita is assumed to remain constant. Food composted is assumed to increase by 1%/year. Emission factors are taken from the nonpoint tool.

Gasoline Stage 1 Distribution – This sector has four (4) sub-sectors as follows

> **Bulk Plants** - The total finished motor gasoline consumption data for years 2012 through 2016 was used to forecast the year 2022 value. It is assumed the fraction passing through bulk plants is constant. It is also assumed the county apportionment of national emissions to county emissions according to employee counts to be constant.

Bulk Terminals - The total finished motor gasoline consumption data for years 2012 through 2016 was used to forecast the year 2022 gasoline supplied value from which a national VOC emissions value is derived using the emission factor from the nonpoint tool. The total finished motor gasoline stocks data for years 2014 through 2016 was used to forecast the year 2022 value from which a state apportionment fraction is derived. It is assumed the county apportionment of national emissions to county emissions according to employee counts to be constant.

Pipeline movement of gasoline - The total finished motor gasoline consumption data for years 2012 through 2016 was used to forecast the year 2022 gasoline supplied value from which a national VOC emissions value is derived using the emission factor from the tool. Pipeline gasoline movement data for years 2012 through 2016 was used to forecast Year 2022 pipeline gasoline movement values. From that the Year 2022 fraction for PAD 2 of the total pipeline gasoline movement was calculated and used as an apportionment factor for PAD 2. Then the county apportionment within the PAD is based on employment data from the tool and is assumed to remain constant.

Service Stations - Total gasoline consumption for Tennessee was obtained from the EIA SEDS. Year 2022 total consumption of motor gasoline was forecast using values from years 2000-2015. Total retail sales data from service stations for each county was obtained from the TN Dept. of Revenue. Year 2022 total and county sales were forecast from retail sales data from years 2010 through 2016. The EIA SEDS data for Tennessee gasoline consumption at state level was apportioned to the counties by the percentage of retail sales of the state total at service stations for each county. Emission factors and SCC percentage split of the total gasoline consumption was taken from the non-point tool.

Human Cremation - US Census data for # of deaths in the state is projected to year 2022 # of deaths. US Census population data was used to forecast the year 2022 for county & state population. County % of state population is used to apportion # of deaths in the state in Year 2022 to each county. The Year 2022 projection of US average % cremation of # of deaths is used to calculate the # of bodies cremated in each county. Average body weight & emission factors are taken from the tool.

Open Burning – This sector has four sub-sectors as follows.

Land Clearing - Nonpoint tool methodology was followed for estimation of disturbed acreage from residential, nonresidential, and road construction using US Census data, Federal Highway Administration data, and US Labor Bureau data to forecast Year 2022 disturbed acreage calculations. USDA Forestry Service FIDO database provided vegetation type acreage for the counties from which fuel loading per acre was calculated. Emission factors from the tool were used to calculate emissions for Year 2022.

MSW - MSW tonnage burned for each county is calculated according to the methodology in the nonpoint tool on a per capita basis. US Census data for 2010 through 2016 is used to forecast the Year 2022 population. The rural to urban percentage split of the county population is assumed to remain constant.

Yard Waste Brush - Yard waste brush tonnage burned for each county is calculated according to the methodology in the nonpoint tool on a per capita basis. US Census data for 2010 through 2016 is used to forecast the Year 2022 population. The rural to urban percentage split of the county population is assumed to remain constant. The forested acreage percentage adjusted for farm land is assumed to be constant and is taken from the nonpoint tool.

Yard Waste Leaf - Yard waste leaf tonnage burned for each county is calculated according to the methodology in the nonpoint tool on a per capita basis. US Census data for 2010 through 2016 is used to forecast the Year 2022 population. The rural to urban percentage split of the county population is assumed to remain constant. The forested acreage percentage adjusted for farm land is assumed to be constant and is taken from the nonpoint tool.

Residential Heating - US Census data for home heating fuel type was obtained for TN counties. Year 2022 values for numbers of homes using each type of fuel was forecast using data for years 2010-2015. EIA SEDS residential fuel consumption data was obtained and Year 2022 values for each fuel type was forecast using data from years 2010-2015. The emission calculations were made following the nonpoint tool methodology, and emission factors were taken from the nonpoint tool.

Industrial, Commercial, & Institutional (ICI) Fuel Combustion - The ICI nonpoint tool was used to obtain the Year 2014 emissions which were compared to those from the 2014 NEI v2 for to determine the stationary source emissions subtraction. This method accounts for some Davidson county and Hamilton county data where the fuel consumption is reported totally within their local program point source inventory. The energy data inputs to the tool were then changed to values forecast for Year 2022 from EIA SEDS data collected for the industrial and commercial sectors. The nonpoint tool output is then used for the Year 2022 emissions. Stationary source emissions subtraction is assumed constant for year 2022.

Residential Wood Consumption (RWC) - The Residential Wood Combustion (RWC) nonpoint tool was used to obtain the year 2014 base year data. EIA energy data on residential wood consumption was collected and Year 2022 forecasts were made. US census data was collected for the numbers of housing types to be used in the tool. Year 2022 forecasts of numbers of house types were made. Energy and housing forecast data was input into the RWC nonpoint tool to obtain Year 2022 emissions.

Residential Charcoal Grilling (RCG) - The Residential Charcoal Grilling (RCG) nonpoint tool was used to determine emissions for both Year 2014 and Year 2022. US census data for numbers of housing types was collected and used for tool input. Values for 2022 were forecast using US Census data from years 2010 through 2015.

Solvents - The nonpoint Solvent tool based on county population was used to obtain both the Year 2014 and the Year 2022 Solvent emissions. The Year 2022 county population data was forecast from the US Census data for years 2010 through 2016. Population data was used for input to the nonpoint tool.

			Year 2014			Year 2022			
County	FIPS	SCC	CO (tons)	NOX (tons)	VOC (tons)	CO (tons)	NOX (tons)	VOC (tons)	
Davidson	47037	2805002000			0.86			0.91	
Rutherford	47149	2805002000			7.07			7.40	
Sumner	47165	2805002000			8.77			9.19	
Williamson	47187	2805002000			5.71			5.98	
Wilson	47189	2805002000			8.45			8.85	
Davidson	47037	2805018000			0.00			0.00	
Rutherford	47149	2805018000			0.78			0.81	
Sumner	47165	2805018000			0.97			1.02	
Williamson	47187	2805018000			0.78			0.81	
Wilson	47189	2805018000			0.58			0.61	
Davidson	47037	2805025000			0.04			0.07	
Rutherford	47149	2805025000			0.93			1.49	
Sumner	47165	2805025000			0.11			0.18	
Williamson	47187	2805025000			0.09			0.14	
Wilson	47189	2805025000			0.32			0.52	
Davidson	47037	2805007100			0.01			0.02	
Rutherford	47149	2805007100			0.27			0.38	
Sumner	47165	2805007100			0.04			0.06	
Williamson	47187	2805007100			0.04			0.06	
Wilson	47189	2805007100			0.06			0.08	
Davidson	47037	2805009100			0.00			0.00	
Rutherford	47149	2805009100			0.00			0.00	
Sumner	47165	2805009100			0.63			0.88	
Williamson	47187	2805009100			0.01			0.02	
Wilson	47189	2805009100			0.01			0.02	**End Ag Livestock**
Davidson	47037	2461850000			1.10			1.10	
Rutherford	47149	2461850000			16.32			16.32	
Sumner	47165	2461850000			21.89			21.89	
Williamson	47187	2461850000			9.09			9.09	
Wilson	47189	2461850000			8.53			8.53	**End Ag Pesticides**
Davidson	47037	2461021000			24.83			32.38	
Rutherford	47149	2461021000			6.89			11.91	
Sumner	47165	2461021000			4.73			5.88	
Williamson	47187	2461021000			4.67			9.19	
Wilson	47189	2461021000			3.63			5.95	
Davidson	47037	2461022000			100.37			130.88	
Rutherford	47149	2461022000			27.85			48.14	
Sumner	47165	2461022000			19.11			23.78	
Williamson	47187	2461022000			18.87			37.15	
Wilson	47189	2461022000			14.65			24.03	**End Asphalt Paving**
Davidson	47037	2501080050			38.97			39.28	
Rutherford	47149	2501080050			37.65			37.95	
Sumner	47165	2501080050			16.78			16.92	
Williamson	47187	2501080050			0.00			0.00	
Wilson	47189	2501080050			3.94			3.97	
Davidson	47037	2501080100			1.33			1.50	
Rutherford	47149	2501080100			1.29			1.45	
Sumner	47165	2501080100			0.57			0.65	
Williamson	47187	2501080100			0.00			0.00	
Wilson	47189	2501080100			0.13			0.15	**End Av Gas**
Davidson	47037	2302002100	16.63	0.00	4.98	19.40	0.00	5.81	
Rutherford	47149	2302002100	4.95	0.00	1.48	5.20	0.00	1.56	
Sumner	47165	2302002100	2.54	0.00	0.76	3.07	0.00	0.92	
Williamson	47187	2302002100	4.35	0.00	1.30	4.82	0.00	1.44	
Wilson	47189	2302002100	2.22	0.00	0.66	2.63	0.00	0.79	
Davidson	47037	2302002200	45.12	0.00	13.79	52.62	0.00	16.09	
Rutherford	47149	2302002200	13.44	0.00	4.11	14.12	0.00	4.31	
Sumner	47165	2302002200	6.90	0.00	2.11	8.32	0.00	2.54	
Williamson	47187	2302002200	11.80	0.00	3.61	13.08	0.00	4.00	
Wilson	47189	2302002200	6.01	0.00	1.84	7.15	0.00	2.18	
Davidson	47037	2302003000	0.00	0.00	3.42	0.00	0.00	3.99	
Rutherford	47149	2302003000	0.00	0.00	1.02	0.00	0.00	1.07	
Sumner	47165	2302003000	0.00	0.00	0.52	0.00	0.00	0.63	
Williamson	47187	2302003000	0.00	0.00	0.90	0.00	0.00	0.99	
Wilson	47189	2302003000	0.00	0.00	0.46	0.00	0.00	0.54	
Davidson	47037	2302003100	3.62	0.00	1.75	4.22	0.00	2.04	
Rutherford	47149	2302003100	1.08	0.00	0.52	1.13	0.00	0.55	
Sumner	47165	2302003100	0.55	0.00	0.27	0.67	0.00	0.32	
Williamson	47187	2302003100	0.95	0.00	0.46	1.05	0.00	0.51	
Wilson	47189	2302003100	0.48	0.00	0.23	0.57	0.00	0.28	
Davidson	47037	2302003200	0.00	0.00	0.07	0.00	0.00	0.08	
Rutherford	47149	2302003200	0.00	0.00	0.02	0.00	0.00	0.02	
Sumner	47165	2302003200	0.00	0.00	0.01	0.00	0.00	0.01	
Williamson	47187	2302003200	0.00	0.00	0.02	0.00	0.00	0.02	
Wilson	47189	2302003200	0.00	0.00	0.01	0.00	0.00	0.01	**End Commercial Cooking**
Davidson	47037	2680003000			19.27			20.42	
Rutherford	47149	2680003000			115.65			122.54	

Sumner	47165	2680003000			19.27			20.42	
Williamson	47187	2680003000			0.00			0.00	
Wilson	47189	2680003000			0.00			0.00	**End Composting**
Davidson	47037	2501055120			107.45			123.88	
Rutherford	47149	2501055120			6.14			7.08	
Sumner	47165	2501055120			6.14			7.08	
Williamson	47187	2501055120			36.84			42.47	
Wilson	47189	2501055120			0.00			0.00	
Davidson	47037	2501050120			100.51			123.19	
Rutherford	47149	2501050120			5.74			7.04	
Sumner	47165	2501050120			5.74			7.04	
Williamson	47187	2501050120			34.46			42.24	
Wilson	47189	2501050120			0.00			0.00	
Davidson	47037	2505040120			68.32			49.05	
Rutherford	47149	2505040120			3.90			2.80	
Sumner	47165	2505040120			3.90			2.80	
Williamson	47187	2505040120			23.42			16.82	
Wilson	47189	2505040120			0.00			0.00	
Davidson	47037	2501060051			708.62			768.03	
Rutherford	47149	2501060051			464.73			571.02	
Sumner	47165	2501060051			148.58			181.74	
Williamson	47187	2501060051			201.84			219.51	
Wilson	47189	2501060051			182.73			277.06	
Davidson	47037	2501060052			0.00			0.00	
Rutherford	47149	2501060052			0.00			0.00	
Sumner	47165	2501060052			0.00			0.00	
Williamson	47187	2501060052			0.00			0.00	
Wilson	47189	2501060052			0.00			0.00	
Davidson	47037	2501060053			27.34			29.64	
Rutherford	47149	2501060053			17.93			22.03	
Sumner	47165	2501060053			5.73			7.01	
Williamson	47187	2501060053			7.79			8.47	
Wilson	47189	2501060053			7.05			10.69	**End Gasoline Stage 1 Distribution**
Davidson	47037	2810060100	0.0146	3.1066	0.0109	0.0147	3.1280	0.0109	
Rutherford	47149	2810060100	0.0063	1.3430	0.0047	0.0053	1.1320	0.0040	
Sumner	47165	2810060100	0.0038	0.8027	0.0028	0.0045	0.9670	0.0034	
Williamson	47187	2810060100	0.0045	0.9538	0.0033	0.0033	0.7110	0.0025	
Wilson	47189	2810060100	0.0027	0.5826	0.0020	0.0032	0.6730	0.0024	**End Human Cremation**
Davidson	47037	2610000500	9494.95	280.92	651.72	11386.09	336.87	781.53	
Rutherford	47149	2610000500	15124.00	447.46	1038.10	14373.23	425.24	986.56	
Sumner	47165	2610000500	885.22	26.19	60.76	974.03	28.82	66.86	
Williamson	47187	2610000500	3718.29	110.01	255.22	5743.62	169.93	394.24	
Wilson	47189	2610000500	784.28	23.20	53.83	1612.10	47.70	110.65	
Davidson	47037	2610030000	111.22	7.85	7.08	124.10	8.76	10.83	
Rutherford	47149	2610030000	239.84	16.93	15.27	290.50	20.51	25.36	
Sumner	47165	2610030000	234.86	16.58	14.95	269.07	18.99	23.49	
Williamson	47187	2610030000	194.04	13.70	12.35	238.97	16.87	20.86	
Wilson	47189	2610030000	235.22	16.60	14.97	281.40	19.86	24.56	
Davidson	47037	2610000400	7.19	0.26	0.98	8.02	0.29	1.09	
Rutherford	47149	2610000400	15.51	0.55	2.10	18.78	0.67	2.55	
Sumner	47165	2610000400	7.59	0.27	1.03	8.70	0.31	1.18	
Williamson	47187	2610000400	12.55	0.45	1.70	15.45	0.55	2.10	
Wilson	47189	2610000400	7.60	0.27	1.03	9.10	0.32	1.23	
Davidson	47037	2610000100	5.75	0.32	1.44	6.42	0.36	1.60	
Rutherford	47149	2610000100	12.41	0.69	3.10	15.03	0.83	3.76	
Sumner	47165	2610000100	6.07	0.34	1.52	6.96	0.39	1.74	
Williamson	47187	2610000100	10.04	0.56	2.51	12.36	0.68	3.09	
Wilson	47189	2610000100	6.08	0.34	1.52	7.28	0.40	1.82	**End Open Burning**
Davidson	47037	2104001000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2104001000	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2104001000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2104001000	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2104001000	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2104002000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2104002000	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2104002000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2104002000	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2104002000	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2104004000	0.115	0.414	0.016	0.063	0.225	0.009	
Rutherford	47149	2104004000	0.017	0.062	0.002	0.000	0.000	0.000	
Sumner	47165	2104004000	0.051	0.183	0.007	0.051	0.185	0.007	
Williamson	47187	2104004000	0.026	0.095	0.004	0.000	0.000	0.000	
Wilson	47189	2104004000	0.032	0.114	0.004	0.226	0.815	0.032	
Davidson	47037	2104011000	0.111	0.399	0.016	0.060	0.217	0.008	
Rutherford	47149	2104011000	0.017	0.060	0.002	0.000	0.000	0.000	
Sumner	47165	2104011000	0.049	0.177	0.007	0.050	0.178	0.007	
Williamson	47187	2104011000	0.025	0.092	0.004	0.000	0.000	0.000	
Wilson	47189	2104011000	0.031	0.110	0.004	0.218	0.786	0.031	
Davidson	47037	2104007000	3.71	13.08	0.51	2.34	8.26	0.32	

Rutherford	47149	2104007000	2.73	9.61	0.37	4.23	14.91	0.58	
Sumner	47165	2104007000	3.15	11.10	0.43	2.81	9.90	0.39	
Williamson	47187	2104007000	3.13	11.04	0.43	3.90	13.75	0.54	
Wilson	47189	2104007000	3.59	12.66	0.49	3.78	13.34	0.52	
Davidson	47037	2104006000	166.26	390.72	22.86	157.39	369.86	21.64	
Rutherford	47149	2104006000	51.09	120.05	7.02	46.99	110.42	6.46	
Sumner	47165	2104006000	45.06	105.88	6.20	43.53	102.29	5.98	
Williamson	47187	2104006000	74.90	176.03	10.30	85.11	200.00	11.70	
Wilson	47189	2104006000	28.63	67.29	3.94	31.54	74.11	4.34	**End Residential Heating**
Davidson	47037	2102001000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102001000	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2102001000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2102001000	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2102001000	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2102002000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102002000	159.44	20.67	0.00	104.22	13.51	0.00	
Sumner	47165	2102002000	61.62	7.99	0.00	40.28	5.22	0.00	
Williamson	47187	2102002000	26.97	3.50	0.00	17.63	2.29	0.00	
Wilson	47189	2102002000	31.44	4.08	0.00	20.55	2.66	0.00	
Davidson	47037	2102004001	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102004001	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2102004001	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2102004001	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2102004001	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2102004002	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102004002	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2102004002	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2102004002	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2102004002	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2102005000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102005000	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2102005000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2102005000	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2102005000	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2102006000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102006000	84.48	0.00	0.00	103.56	0.00	0.00	
Sumner	47165	2102006000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2102006000	25.10	0.00	0.00	30.77	0.00	0.00	
Wilson	47189	2102006000	28.89	0.00	0.00	35.42	0.00	0.00	
Davidson	47037	2102007000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102007000	0.03	0.04	0.00	0.03	0.06	0.00	
Sumner	47165	2102007000	0.01	0.02	0.00	0.01	0.02	0.00	
Williamson	47187	2102007000	0.00	0.01	0.00	0.01	0.01	0.00	
Wilson	47189	2102007000	0.00	0.01	0.00	0.01	0.01	0.00	
Davidson	47037	2102008000	730.39	230.25	18.57	0.00	0.00	0.00	
Rutherford	47149	2102008000	565.40	169.15	14.93	565.40	169.15	14.93	
Sumner	47165	2102008000	218.52	65.37	5.77	218.52	65.37	5.77	
Williamson	47187	2102008000	95.65	28.61	2.53	95.65	28.61	2.53	
Wilson	47189	2102008000	111.48	33.35	2.94	111.48	33.35	2.94	
Davidson	47037	2102011000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2102011000	0.03	0.14	0.00	0.03	0.14	0.00	
Sumner	47165	2102011000	0.01	0.05	0.00	0.01	0.05	0.00	
Williamson	47187	2102011000	0.01	0.02	0.00	0.01	0.02	0.00	
Wilson	47189	2102011000	0.01	0.03	0.00	0.01	0.03	0.00	
Davidson	47037	2103001000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2103001000	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2103001000	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2103001000	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2103001000	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2103002000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2103002000	4.89	9.97	0.05	1.63	3.32	0.02	
Sumner	47165	2103002000	2.17	4.42	0.02	0.72	1.47	0.01	
Williamson	47187	2103002000	6.65	13.55	0.06	2.22	4.52	0.02	
Wilson	47189	2103002000	1.93	3.94	0.02	0.64	1.31	0.01	
Davidson	47037	2103004001	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2103004001	0.00	0.00	0.00	0.00	0.00	0.00	
Sumner	47165	2103004001	0.00	0.00	0.00	0.00	0.00	0.00	
Williamson	47187	2103004001	0.00	0.00	0.00	0.00	0.00	0.00	
Wilson	47189	2103004001	0.00	0.00	0.00	0.00	0.00	0.00	
Davidson	47037	2103004002	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2103004002	0.54	2.57	0.21	0.56	2.64	0.21	
Sumner	47165	2103004002	0.36	1.67	0.12	0.37	1.72	0.12	
Williamson	47187	2103004002	1.10	5.14	0.36	1.14	5.29	0.37	
Wilson	47189	2103004002	0.32	1.49	0.10	0.33	1.54	0.11	
Davidson	47037	2103005000	0.00	0.00	0.00	0.00	0.00	0.00	
Rutherford	47149	2103005000	0.00	0.06	0.00	0.00	0.00	0.00	
Sumner	47165	2103005000	0.00	0.03	0.00	0.00	0.00	0.00	
Williamson	47187	2103005000	0.00	0.08	0.00	0.00	0.00	0.00	
Wilson	47189	2103005000	0.00	0.02	0.00	0.00	0.00	0.00	

Davidson	47037	2103006000	695.90	828.45	45.57	656.68	781.77	43.00
Rutherford	47149	2103006000	47.50	68.81	3.08	44.82	64.93	2.91
Sumner	47165	2103006000	20.27	29.36	1.32	19.13	27.71	1.24
Williamson	47187	2103006000	64.55	93.52	4.19	60.91	88.25	3.96
Wilson	47189	2103006000	18.76	27.18	1.22	17.70	25.65	1.15
Davidson	47037	2103007000	0.00	0.00	0.00	0.00	0.00	0.00
Rutherford	47149	2103007000	2.12	3.79	0.14	0.88	1.57	0.06
Sumner	47165	2103007000	0.94	1.68	0.06	0.39	0.70	0.03
Williamson	47187	2103007000	2.89	5.16	0.19	1.20	2.14	0.08
Wilson	47189	2103007000	0.84	1.50	0.05	0.35	0.62	0.02
Davidson	47037	2103008000	50.57	18.54	1.43	0.00	0.00	0.00
Rutherford	47149	2103008000	0.00	0.00	0.00	0.00	0.00	0.00
Sumner	47165	2103008000	0.00	0.00	0.00	0.00	0.00	0.00
Williamson	47187	2103008000	0.00	0.00	0.00	0.00	0.00	0.00
Wilson	47189	2103008000	0.00	0.00	0.00	0.00	0.00	0.00
Davidson	47037	2103011000	0.00	0.00	0.00	0.00	0.00	0.00
Rutherford	47149	2103011000	0.01	0.05	0.00	0.01	0.05	0.00
Sumner	47165	2103011000	0.01	0.02	0.00	0.01	0.02	0.00
Williamson	47187	2103011000	0.02	0.07	0.00	0.02	0.07	0.00
Wilson	47189	2103011000	0.00	0.02	0.00	0.00	0.02	0.00 **End ICI Fuel Combustion**
Davidson	47037	2104008100	157.52	2.75	19.98	253.36	5.27	26.18
Rutherford	47149	2104008100	97.47	1.70	12.36	125.28	2.19	15.89
Sumner	47165	2104008100	75.72	1.32	9.61	97.60	1.70	12.38
Williamson	47187	2104008100	79.90	1.39	10.13	102.86	1.79	13.05
Wilson	47189	2104008100	58.51	1.02	7.42	75.51	1.32	9.58
Davidson	47037	2104008210	97.60	1.18	22.41	124.00	1.50	28.48
Rutherford	47149	2104008210	60.39	0.73	13.87	77.62	0.94	17.82
Sumner	47165	2104008210	46.92	0.57	10.77	60.47	0.73	13.89
Williamson	47187	2104008210	49.51	0.60	11.37	63.73	0.77	14.63
Wilson	47189	2104008210	36.25	0.44	8.32	46.79	0.57	10.74
Davidson	47037	2104008220	34.04	0.47	2.46	42.10	0.51	2.67
Rutherford	47149	2104008220	21.06	0.29	1.53	26.36	0.32	1.67
Sumner	47165	2104008220	16.36	0.23	1.18	20.53	0.25	1.30
Williamson	47187	2104008220	17.26	0.24	1.25	21.64	0.26	1.37
Wilson	47189	2104008220	12.64	0.17	0.92	15.89	0.19	1.01
Davidson	47037	2104008230	7.47	0.12	0.90	9.29	0.13	0.99
Rutherford	47149	2104008230	4.62	0.07	0.56	5.82	0.08	0.62
Sumner	47165	2104008230	3.59	0.06	0.43	4.53	0.06	0.48
Williamson	47187	2104008230	3.79	0.06	0.46	4.78	0.07	0.51
Wilson	47189	2104008230	2.77	0.04	0.34	3.51	0.05	0.37
Davidson	47037	2104008310	275.10	3.34	63.17	348.08	4.22	79.93
Rutherford	47149	2104008310	256.78	3.12	58.97	329.51	4.00	75.67
Sumner	47165	2104008310	235.71	2.86	54.13	303.40	3.68	69.67
Williamson	47187	2104008310	221.31	2.68	50.82	284.51	3.45	65.33
Wilson	47189	2104008310	204.09	2.48	46.87	262.84	3.19	60.36
Davidson	47037	2104008320	181.21	2.49	13.12	223.22	2.69	14.17
Rutherford	47149	2104008320	169.14	2.33	12.25	211.33	2.55	13.41
Sumner	47165	2104008320	155.26	2.14	11.24	194.59	2.35	12.35
Williamson	47187	2104008320	145.78	2.01	10.56	182.47	2.20	11.58
Wilson	47189	2104008320	134.43	1.85	9.73	168.57	2.03	10.70
Davidson	47037	2104008330	90.95	1.47	11.01	112.71	1.60	12.00
Rutherford	47149	2104008330	84.89	1.37	10.28	106.70	1.51	11.36
Sumner	47165	2104008330	77.93	1.26	9.44	98.25	1.39	10.46
Williamson	47187	2104008330	73.17	1.18	8.86	92.13	1.31	9.81
Wilson	47189	2104008330	67.47	1.09	8.17	85.11	1.21	9.06
Davidson	47037	2104008400	8.04	1.92	1.11	10.17	2.43	1.41
Rutherford	47149	2104008400	7.50	1.79	1.04	9.63	2.30	1.33
Sumner	47165	2104008400	6.89	1.65	0.95	8.87	2.12	1.23
Williamson	47187	2104008400	6.47	1.55	0.89	8.32	1.99	1.15
Wilson	47189	2104008400	5.96	1.43	0.82	7.68	1.84	1.06
Davidson	47037	2104008510	6.41	0.06	0.41	8.08	0.08	0.52
Rutherford	47149	2104008510	12.04	0.12	0.77	15.43	0.15	0.99
Sumner	47165	2104008510	12.73	0.13	0.82	16.38	0.16	1.05
Williamson	47187	2104008510	11.08	0.11	0.71	14.23	0.14	0.91
Wilson	47189	2104008510	11.86	0.12	0.76	15.28	0.15	0.98
Davidson	47037	2104008610	30.52	0.17	5.71	30.52	0.17	5.71
Rutherford	47149	2104008610	57.40	0.32	10.75	57.40	0.32	10.75
Sumner	47165	2104008610	58.00	0.32	10.86	58.00	0.32	10.86
Williamson	47187	2104008610	47.80	0.27	8.95	47.80	0.26	8.95
Wilson	47189	2104008610	52.14	0.29	9.76	52.14	0.29	9.76
Davidson	47037	2104008700	6.74	0.12	0.86	6.74	0.12	0.86
Rutherford	47149	2104008700	2.49	0.04	0.32	2.49	0.04	0.32
Sumner	47165	2104008700	1.55	0.03	0.20	1.55	0.03	0.20
Williamson	47187	2104008700	1.69	0.03	0.21	1.69	0.03	0.21
Wilson	47189	2104008700	0.86	0.02	0.11	0.86	0.02	0.11
Davidson	47037	2104009000	80.15	4.92	25.35	80.15	4.92	25.35
Rutherford	47149	2104009000	30.37	1.87	9.61	30.37	1.87	9.61
Sumner	47165	2104009000	18.92	1.16	5.99	18.92	1.16	5.99
Williamson	47187	2104009000	21.04	1.29	6.65	21.04	1.29	6.65

Wilson	47189	2104009000	13.49	0.83	4.27	13.49	0.83	4.27	**End Residential Wood Combustion**
Davidson	47037	2810025000	1250.30	26.83	23.38	1280.36	27.47	23.94	
Rutherford	47149	2810025000	586.58	12.59	10.97	626.20	13.44	11.71	
Sumner	47165	2810025000	370.31	7.95	6.92	374.36	8.03	7.00	
Williamson	47187	2810025000	457.06	9.81	8.55	477.88	10.25	8.94	
Wilson	47189	2810025000	264.46	5.67	4.94	276.89	5.94	5.18	**End Residential Charcoal Grilling**
Davidson	47037	2401001000			771.08			872.53	
Rutherford	47149	2401001000			329.21			409.41	
Sumner	47165	2401001000			197.86			231.50	
Williamson	47187	2401001000			232.80			295.71	
Wilson	47189	2401001000			142.76			175.48	
Davidson	47037	2401005000			177.48			177.48	
Rutherford	47149	2401005000			43.67			43.67	
Sumner	47165	2401005000			22.28			22.28	
Williamson	47187	2401005000			83.52			83.52	
Wilson	47189	2401005000			21.02			21.02	
Davidson	47037	2401008000			103.57			103.57	
Rutherford	47149	2401008000			44.22			44.22	
Sumner	47165	2401008000			26.58			26.58	
Williamson	47187	2401008000			31.27			31.27	
Wilson	47189	2401008000			19.17			19.17	
Davidson	47037	2401015000			10.68			10.68	
Rutherford	47149	2401015000			7.34			7.34	
Sumner	47165	2401015000			1.27			1.27	
Williamson	47187	2401015000			0.86			0.86	
Wilson	47189	2401015000			3.74			3.74	
Davidson	47037	2401020000			89.53			89.53	
Rutherford	47149	2401020000			25.13			25.13	
Sumner	47165	2401020000			3.48			3.48	
Williamson	47187	2401020000			1.58			1.58	
Wilson	47189	2401020000			4.40			4.40	
Davidson	47037	2401025000			43.48			43.48	
Wilson	47189	2401025000			3.37			3.37	
Davidson	47037	2401030000			11.32			11.32	
Sumner	47165	2401030000			1.81			1.81	
Williamson	47187	2401030000			11.32			11.32	
Wilson	47189	2401030000			1.81			1.81	
Davidson	47037	2401055000			10.10			10.10	
Rutherford	47149	2401055000			1.26			1.26	
Sumner	47165	2401055000			3.37			3.37	
Williamson	47187	2401055000			1.67			1.67	
Williamson	47187	2401060000			28.59			28.59	
Davidson	47037	2401065000			0.09			0.09	
Davidson	47037	2401070000			40.15			40.15	
Rutherford	47149	2401070000			593.69			593.69	
Sumner	47165	2401070000			117.27			117.27	
Williamson	47187	2401070000			3.36			3.36	
Wilson	47189	2401070000			57.32			57.32	
Davidson	47037	2401075000			5.56			5.56	
Rutherford	47149	2401075000			0.07			0.07	
Wilson	47189	2401075000			0.07			0.07	
Williamson	47187	2401080000			0.28			0.28	
Davidson	47037	2401090000			62.00			62.00	
Rutherford	47149	2401090000			10.30			10.30	
Sumner	47165	2401090000			3.16			3.16	
Williamson	47187	2401090000			2.11			2.11	
Wilson	47189	2401090000			0.34			0.34	
Davidson	47037	2401100000			198.74			224.89	
Rutherford	47149	2401100000			84.85			105.52	
Sumner	47165	2401100000			51.00			59.67	
Williamson	47187	2401100000			60.00			76.22	
Wilson	47189	2401100000			36.80			45.23	
Davidson	47037	2401200000			1.98			2.24	
Rutherford	47149	2401200000			0.84			1.05	
Sumner	47165	2401200000			0.51			0.59	
Williamson	47187	2401200000			0.60			0.76	
Wilson	47189	2401200000			0.37			0.45	
Davidson	47037	2415000000			517.78			517.78	
Rutherford	47149	2415000000			267.16			267.16	
Sumner	47165	2415000000			110.49			110.49	
Williamson	47187	2415000000			78.10			78.10	
Wilson	47189	2415000000			93.77			93.77	
Davidson	47037	2420000000			2.01			2.01	
Rutherford	47149	2420000000			0.37			0.37	
Sumner	47165	2420000000			0.29			0.29	
Williamson	47187	2420000000			0.45			0.45	
Wilson	47189	2420000000			0.21			0.21	
Davidson	47037	2425000000			1219.23			1379.64	
Rutherford	47149	2425000000			520.54			647.35	

Sumner	47165	2425000000			312.86			366.04	
Williamson	47187	2425000000			368.10			467.58	
Wilson	47189	2425000000			225.73			277.47	
Davidson	47037	2460100000			659.04			745.75	
Rutherford	47149	2460100000			281.37			349.92	
Sumner	47165	2460100000			169.11			197.86	
Williamson	47187	2460100000			198.98			252.74	
Wilson	47189	2460100000			122.02			149.99	
Davidson	47037	2460200000			724.95			820.33	
Rutherford	47149	2460200000			309.51			384.91	
Sumner	47165	2460200000			186.03			217.65	
Williamson	47187	2460200000			218.87			278.02	
Wilson	47189	2460200000			134.22			164.98	
Davidson	47037	2460400000			448.15			507.11	
Rutherford	47149	2460400000			191.33			237.95	
Sumner	47165	2460400000			115.00			134.55	
Williamson	47187	2460400000			135.30			171.87	
Wilson	47189	2460400000			82.97			101.99	
Davidson	47037	2460500000			313.04			354.23	
Rutherford	47149	2460500000			133.65			166.21	
Sumner	47165	2460500000			80.33			93.98	
Williamson	47187	2460500000			94.51			120.05	
Wilson	47189	2460500000			57.96			71.24	
Davidson	47037	2460600000			187.83			212.54	
Rutherford	47149	2460600000			80.19			99.73	
Sumner	47165	2460600000			48.20			56.39	
Williamson	47187	2460600000			56.71			72.03	
Wilson	47189	2460600000			34.77			42.75	
Davidson	47037	2460800000			586.55			663.72	
Rutherford	47149	2460800000			250.42			311.43	
Sumner	47165	2460800000			150.51			176.10	
Williamson	47187	2460800000			177.09			224.94	
Wilson	47189	2460800000			108.59			133.49	
Davidson	47037	2460900000			23.07			26.10	
Rutherford	47149	2460900000			9.85			12.25	
Sumner	47165	2460900000			5.92			6.93	
Williamson	47187	2460900000			6.96			8.85	
Wilson	47189	2460900000			4.27			5.25	**End Solvents**
Davidson	47037	**County Total**	13,557.59	1,820.13	8,370.55	14,946.22	1,560.85	9,313.44	
Rutherford	47149	**County Total**	17,720.28	898.35	5,132.90	17,214.49	858.80	5,799.39	
Sumner	47165	**County Total**	2,575.86	291.80	2,088.71	2,854.15	286.31	2,395.87	
Williamson	47187	**County Total**	5,388.88	483.77	2,552.21	7,650.95	557.51	3,193.36	
Wilson	47189	**County Total**	2,132.82	208.23	1,571.55	3,167.04	240.82	1,988.39	**County Totals**
		5 County Total	41,375	3,702	19,716	45,833	3,504	22,690	

Agricultural Livestock

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	**Year 2022** CO (tons)	**Year 2022** NOX (tons)	**Year 2022** VOC (tons)
Davidson	47037	0.00	0.00	0.92	0.00	0.00	1.00
Rutherford	47149	0.00	0.00	9.05	0.00	0.00	10.09
Sumner	47165	0.00	0.00	10.52	0.00	0.00	11.31
Williamsor	47187	0.00	0.00	6.63	0.00	0.00	7.01
Wilson	47189	0.00	0.00	9.43	0.00	0.00	10.08
		0.00	0.00	36.56	0.00	0.00	39.49

Agricultural Pesticides

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	1.10	0.00	0.00	1.10
Rutherford	47149	0.00	0.00	16.32	0.00	0.00	16.32
Sumner	47165	0.00	0.00	21.89	0.00	0.00	21.89
Williamsor	47187	0.00	0.00	9.09	0.00	0.00	9.09
Wilson	47189	0.00	0.00	8.53	0.00	0.00	8.53
		0.00	0.00	56.92	0.00	0.00	56.92

Asphalt Paving

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	125.21	0.00	0.00	163.26
Rutherford	47149	0.00	0.00	34.74	0.00	0.00	60.05
Sumner	47165	0.00	0.00	23.84	0.00	0.00	29.67
Williamsor	47187	0.00	0.00	23.54	0.00	0.00	46.34
Wilson	47189	0.00	0.00	18.28	0.00	0.00	29.98
		0.00	0.00	225.61	0.00	0.00	329.30

Aviation Gasoline

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	40.30	0.00	0.00	40.79
Rutherford	47149	0.00	0.00	38.93	0.00	0.00	39.40
Sumner	47165	0.00	0.00	17.36	0.00	0.00	17.56
Williamsor	47187	0.00	0.00	0.00	0.00	0.00	0.00
Wilson	47189	0.00	0.00	4.07	0.00	0.00	4.12
		0.00	0.00	100.66	0.00	0.00	101.87

Commercial Cooking

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	65.37	0.00	24.01	76.24	0.00	28.01
Rutherford	47149	19.47	0.00	7.15	20.45	0.00	7.51
Sumner	47165	9.99	0.00	3.67	12.06	0.00	4.42
Williamsor	47187	17.10	0.00	6.29	18.95	0.00	6.96
Wilson	47189	8.71	0.00	3.20	10.35	0.00	3.80
		120.64	0.00	44.32	138.05	0.00	50.70

Composting

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	19.27	0.00	0.00	20.42
Rutherford	47149	0.00	0.00	115.65	0.00	0.00	122.54
Sumner	47165	0.00	0.00	19.27	0.00	0.00	20.42
Williamsor	47187	0.00	0.00	0.00	0.00	0.00	0.00
Wilson	47189	0.00	0.00	0.00	0.00	0.00	0.00
		0.00	0.00	154.20	0.00	0.00	163.38

Gasoline Stage 1 Distribution

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	1,012.24	0.00	0.00	1,093.79
Rutherford	47149	0.00	0.00	498.45	0.00	0.00	609.98
Sumner	47165	0.00	0.00	170.10	0.00	0.00	205.67
Williamsor	47187	0.00	0.00	304.35	0.00	0.00	329.51
Wilson	47189	0.00	0.00	189.78	0.00	0.00	287.75
		0.00	0.00	2,174.90	0.00	0.00	2,526.70

Human Cremation

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.01	3.11	0.01	0.01	3.13	0.01
Rutherford	47149	0.01	1.34	0.00	0.01	1.13	0.00
Sumner	47165	0.00	0.80	0.00	0.00	0.97	0.00
Williamsor	47187	0.00	0.95	0.00	0.00	0.71	0.00
Wilson	47189	0.00	0.58	0.00	0.00	0.67	0.00
		0.03	6.79	0.02	0.03	6.61	0.02

Open Burning

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	9,619.12	289.34	661.22	11,524.63	346.27	795.06
Rutherford	47149	15,391.76	465.63	1,058.57	14,697.54	447.25	1,018.23
Sumner	47165	1,133.75	43.38	78.26	1,258.76	48.51	93.27
Williamsor	47187	3,934.92	124.71	271.78	6,010.40	188.03	420.28
Wilson	47189	1,033.20	40.42	71.36	1,909.88	68.29	138.27
		31,112.74	963.47	2,141.20	35,401.21	1,098.35	2,465.11

Residential Heating

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	170.20	404.60	23.40	159.85	378.57	21.98
Rutherford	47149	53.85	129.79	7.40	51.21	125.33	7.04
Sumner	47165	48.31	117.35	6.64	46.43	112.55	6.38
Williamsor	47187	78.09	187.25	10.74	89.01	213.75	12.24
Wilson	47189	32.28	80.17	4.44	35.76	89.05	4.92
		382.72	919.16	52.62	382.27	919.24	52.56

ICI Fuel Combustion

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	1,476.86	1,077.24	65.57	656.68	781.77	43.00
Rutherford	47149	864.45	275.25	18.41	821.15	255.38	18.13
Sumner	47165	303.91	110.62	7.29	279.45	102.30	7.17
Williamsor	47187	222.94	149.65	7.33	209.54	131.19	6.95
Wilson	47189	193.68	71.61	4.34	186.49	65.19	4.23
		3,061.83	1,684.36	102.94	2,153.32	1,335.82	79.48

Residential Wood Combustion

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	975.74	19.02	166.51	1,248.43	23.65	198.26
Rutherford	47149	804.17	13.75	132.29	997.93	16.27	159.44
Sumner	47165	709.59	11.71	115.62	883.09	13.96	139.85
Williamsor	47187	678.78	11.41	110.87	845.17	13.57	134.17
Wilson	47189	600.49	9.77	97.49	747.67	11.68	118.00
		3,768.77	65.67	622.78	4,722.29	79.13	749.72

Residential Charcoal Grilling

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	1,250.30	26.83	23.38	1,280.36	27.47	23.94
Rutherford	47149	586.58	12.59	10.97	626.20	13.44	11.71
Sumner	47165	370.31	7.95	6.92	374.36	8.03	7.00
Williamsor	47187	457.06	9.81	8.55	477.88	10.25	8.94
Wilson	47189	264.46	5.67	4.94	276.89	5.94	5.18
		2,928.71	62.84	54.76	3,035.68	65.14	56.76

Solvents

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	0.00	0.00	6,207.41	0.00	0.00	6,882.82
Rutherford	47149	0.00	0.00	3,184.97	0.00	0.00	3,718.95
Sumner	47165	0.00	0.00	1,607.33	0.00	0.00	1,831.25
Williamsor	47187	0.00	0.00	1,793.03	0.00	0.00	2,211.86
Wilson	47189	0.00	0.00	1,155.68	0.00	0.00	1,373.53
		0.00	0.00	13,948.42	0.00	0.00	16,018.41

Non-Point Inventory Totals

County	FIPS	Year 2014 CO (tons)	Year 2014 NOX (tons)	Year 2014 VOC (tons)	Year 2022 CO (tons)	Year 2022 NOX (tons)	Year 2022 VOC (tons)
Davidson	47037	13,557.59	1,820.13	8,370.55	14,946.22	1,560.85	9,313.44
Rutherford	47149	17,720.28	898.35	5,132.90	17,214.49	858.80	5,799.39
Sumner	47165	2,575.86	291.80	2,088.71	2,854.15	286.31	2,395.87
Williamsor	47187	5,388.88	483.77	2,552.21	7,650.95	557.51	3,193.36
Wilson	47189	2,132.82	208.23	1,571.55	3,167.04	240.82	1,988.39
		41,375.44	3,702.28	19,715.92	45,832.86	3,504.30	22,690.44

Nonpoint emissions (in tons per year)

Carbon Monoxide (CO), Nitrogen Oxides (NOx), and Volatile Organic Compounds (VOC)

	2014		
Category	**CO**	**NOx**	**VOC**
Agricultural Livestock	0	0	37
Agricultural Pesticides	0	0	57
Asphalt Paving	0	0	226
Aviation Gasoline	0	0	101
Commercial Cooking	121	0	44
Composting	0	0	154
Gasoline Stage 1 Distribution	0	0	2,175
Human Cremation	0.03	6.79	0.02
Open Burning	31,113	963	2,141
Residential Heating	383	919	53
Industrial, Commercial, & Institutional Fuel Combustion	3,062	1,684	103
Residential Wood Combustion	3,769	66	623
Residential Charcoal Grilling	2,929	63	55
Solvents	0	0	13,948
Total Emissions	41,375	3,702	19,716

	2022		
Category	**CO**	**NOx**	**VOC**
Agricultural Livestock	0	0	39
Agricultural Pesticides	0	0	57
Asphalt Paving	0	0	329
Aviation Gasoline	0	0	102
Commercial Cooking	138	0	51
Composting	0	0	163
Gasoline Stage 1 Distribution	0	0	2,527
Human Cremation	0.03	6.61	0.02
Open Burning	35,401	1,098	2,465
Residential Heating	382	919	53
Industrial, Commercial, & Institutional Fuel Combustion	2,153	1,336	79
Residential Wood Combustion	4,722	79	750
Residential Charcoal Grilling	3,036	65	57
Solvents	0	0	16,018
Total Emissions	45,833	3,504	22,690

Appendix K

Sensitivity Analysis

of Ozone to NOx and VOC

Sensitivity Analysis

As part of the **S**outh**E**astern **M**odeling, **A**nalysis, and **P**lanning (SEMAP) project, Georgia Tech performed an analysis of the sensitivity of ozone concentrations in the Eastern U.S. to reductions in emissions of both nitrogen oxides (NOx) and volatile organic compounds (VOCs). This analysis was based off of the 2007 and 2018 SEMAP modeling which used CMAQ version 5.01 with updates to the vertical mixing coefficients and land-water interface. The entire "ozone season" was modeled (May 1 – September 30) using a 12-km modeling grid that covered the Eastern U.S.

Sensitivities were modeled relative to 2018 emissions to evaluate the impact of NOx and VOC reductions on daily 8-hour maximum ozone concentrations. Each emission sensitivity run reduced the 2018 anthropogenic NOx or VOC emissions (point, area, mobile, nonroad, marine/aircraft/rail) within a specific geographic region by 30%. The 14 geographic regions included Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, West Virginia, Maryland, MANE-VU (minus MD), LADCO, and CENRAP. This resulted in a total of 28 model runs (2 precursors x 14 regions). The NOx and VOC sensitivities were evaluated at every ozone monitor in the domain.

The TDEC-APC used the SEMAP NOx and VOC sensitivity modeling to examine the normalized sensitivities of NOx and VOC emissions on 8-hour daily maximum ozone concentrations (part per billion ozone/ton per day, ppb/TPD) at five ozone monitors in Middle Tennessee area (which includes Davidson, Sumner, Wilson, Rutherford, and Williamson Counties). This analysis started with the day-by-day NOx and VOC emission sensitivities (ppb) for May 1 – September 30. Not all modeled days were used in the calculations. The criteria for selecting days to include in the calculation generally follows the approach used by EPA to select days to include in the relative response factor (RRF) calculation as described in EPA's "Draft Modeling Guidance for Demonstrating Attainment of Air Quality Goals for Ozone, $PM_{2.5}$, and Regional Haze" (December 3, 2014). For this analysis, the 10 highest modeled days in 2018 were selected to be included in the average sensitivity calculation at each monitoring site to address the 2008 and 2015 ozone NAAQS.

The average absolute sensitivity was calculated for NOx and VOCs at each Middle Tennessee ozone monitor location (Table 1). The average absolute NOx sensitivity across Middle Tennessee is **3.326 ppb** for a 30% reduction in NOx emissions across Tennessee and the average absolute VOC sensitivity across Middle Tennessee County is **0.061 ppb** for a 30% reduction in VOC emissions across Tennessee.

Table 1: Absolute NOx and VOC Sensitivity at five Middle Tennessee Ozone Monitors

Site ID	Location	Site Name	30% NOx (ppb)	30% VOC (ppb)
47-037-0026	Davidson County	Percy Priest	-4.015	-0.140
47-037-0011	Davidson County	Trinity Lane	-3.795	-0.159
47-165-0007	Sumner County	Rockland Recreation Area	-3.083	-0.004
47-187-0106	Williamson County	Fairview Middle School	-2.921	-0.008
47-189-0103	Wilson County	Cedars of Lebanon State Park	-2.818	0.005
		Average	-3.326	-0.061

Next, the average absolute sensitivity at each monitor was normalized by the emission reduction to give the normalized sensitivity (ppb/TPD). The SEMAP 30% emission reductions were statewide, but the ozone impacts at the Middle Tennessee monitors will mostly results from the local NOx and VOC emission reductions in the Middle Tennessee 5-county area. Therefore, it was not appropriate to normalize the local NOx and VOC sensitivity results by the statewide emission reduction. Instead, a conservative approach would be to assume the ozone impacts at the Middle Tennessee monitors resulted solely from the local NOx and VOC emission reductions in Middle Tennessee. Therefore, the average absolute sensitivity was normalized by the emission reductions from NOx and VOC reductions in Middle Tennessee. The anthropogenic NOx emissions in Middle Tennessee are 25,160 TPY, so a 30% reduction is 7,548.0 TPY or 20.68 TPD. The anthropogenic VOC emissions in Middle Tennessee are 35,382 TPY, so a 30% reduction is 10,614.6 TPY or 29.08 TPD. The normalized sensitivity was calculated for NOx and VOCs at each Middle Tennessee ozone monitor location (Table 2). The average normalized NOx sensitivity across Middle Tennessee is **0.1609 ppb/TPD** and the average normalized VOC sensitivity across Middle Tennessee is **0.00210 ppb/TPD**.

Table 2: Normalized NOx and VOC Sensitivity at five Middle Tennessee Ozone Monitors

Site ID	**Location**	**Site Name**	**30% NOx (ppb/TPD)**	**30% VOC (ppb/TPD)**
47-037-0026	Davidson County	Percy Priest	-0.1942	-0.00481
47-037-0011	Davidson County	Trinity Lane	-0.1835	-0.00547
47-165-0007	Sumner County	Rockland Recreation Area	-0.1491	-0.00014
47-187-0106	Williamson County	Fairview Middle School	-0.1413	-0.00028
47-189-0103	Wilson County	Cedars of Lebanon State Park	-0.1363	0.00017
		Average	-0.1609	-0.00210

Although the SEMAP study projected emissions and ozone concentrations in 2018, it is estimated that a similar response to NOx and VOC reductions would occur in 2022. In order to look at the impact of the removal of the I/M program, the site-specific normalized sensitivities are multiplied by the increase in NOx and/or VOC emissions. The site-specific normalized NOx and VOC sensitivities were applied to the expected emissions increases due to the removal of the I/M program. The emissions increases are based on 2022 values. As stated in Section 3.5, the removal of the I/M program results in an increase in NOx emissions of 478.52 tons per year and VOC emissions of 593.1 tons per year in 2022. A simple average of these totals results in an increase in NOx emissions of 1.311 tons per day and VOC emissions of 1.625 tons per day in 2022. Although these values represent an average day and the SEMAP project used an ozone season day, it is expected that the increase in emissions on an average day and an ozone season day would be similar and would not change the conclusions drawn from this sensitivity analysis.

The corresponding ozone increases at each monitor are found in Table 3 and demonstrate a very small increase in ozone concentrations. The highest increase was 0.262 ppb at the Percy Priest monitor (AIRS ID 47-037-0026). The calculated changes in ozone levels are well below the level of precision of the ambient ozone monitors (1 ppb).

Table 3: Emissions Increases Due to I/M removal and Effects on Ozone Formation

AIRS ID	2022 NO_X Emissions Increase (tons/day)	Corresponding O_3 Increase at Monitor due to NO_X Increase (ppb)	2022 VOC Emissions Increase (tons/day)	Corresponding O_3 Increase at Monitor due to VOC Increase (ppb)	Corresponding O_3 Increase at Monitor due to combined NOx and VOC increases (ppb)
47-037-0026	1.311	0.25454	1.625	0.00782	0.262
47-037-0011	1.311	0.24059	1.625	0.00888	0.249
47-165-0007	1.311	0.19545	1.625	0.00022	0.196
47-187-0106	1.311	0.18518	1.625	0.00045	0.186
47-189-0103	1.311	0.17865	1.625	-0.00028	0.178